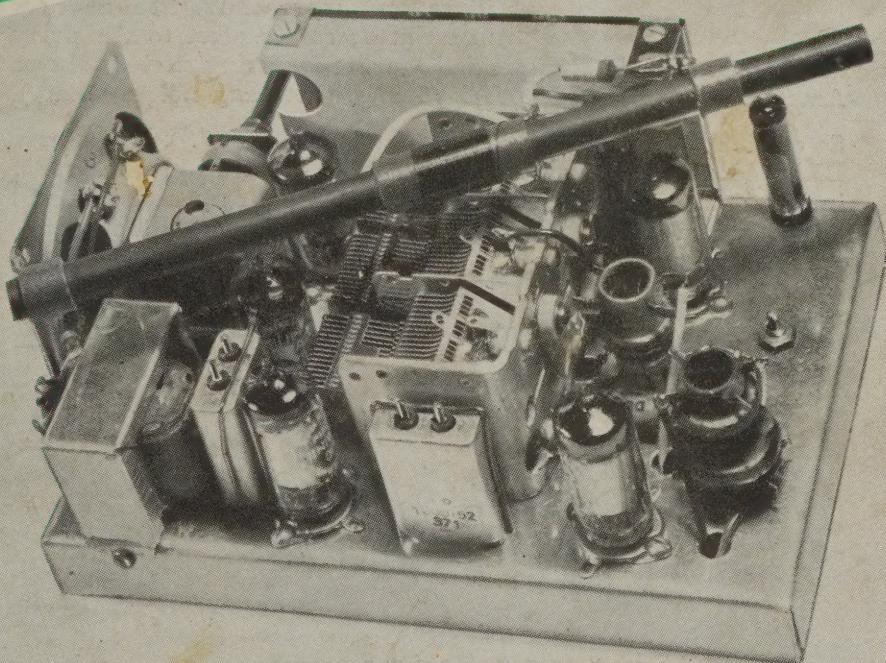


RADIO and ELECTRICAL

TELEVISION - COMMUNICATIONS - SERVICE - SOUND

Review

incorporating "RADIO and ELECTRONICS"



OCTOBER 1st 1954

VOL. 9, NO. 8

PRICE
1/10

British Brimar's your best bet because . . .
Brimar offers the widest and
finest range of



★ American types

The world-accepted BRIMAR American types are now readily available in every corner of the globe. BRIMAR combines cost-saving techniques with craftsmanship - precision second to none.

More and more industries and set manufacturers are alert to the many advantages BRIMAR offers and are standardizing exclusively on American-type BRIMAR VALVES (without expending dollars).

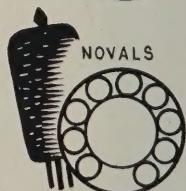
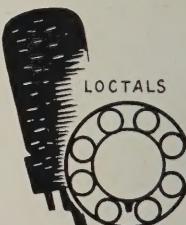
So efficient . . . so reliable . . . so robust . . . no wonder BRIMAR VALVES are chosen by all the world's greatest radio installations—B.B.C., Eiffel Tower, Queen Elizabeth's radio, and all the world's largest airways. BRIMAR'S proven reliability is your guarantee.

NOW IS THE TIME TO BRIMARIZE WITH

Dependable

BRIMAR

**RADIO VALVES
TELETUBES**



STANDARD TELEPHONES

AUCKLAND
CHRISTCHURCH

Box 571
Box 983



and CABLES PTY. LTD.

WELLINGTON
WANGANUI

Box 593
Box 293

Radio and Electrical Review

OUR COVER:

This month's cover picture shows our latest five-valve battery portable, which is fully described in this issue, commencing on page 21.



Official Journal of
The N.Z. Electronics Institute (Inc.).
The N.Z. Radio and Television Manufacturers' Federation.
The N.Z. Radio and Electrical Traders' Federation.
N.Z. Radio, TV and Electrical Assn. (Inc.).

Managing and Technical Director:
W. D. FOSTER, B.Sc.

Advertising Manageress:
Miss D. JAMIESON

Subscriptions:

1s. 10d. per copy; 23s. 6d. per annum,
posted.

Advertising Rates supplied on application.

CORRESPONDENCE

All correspondence and contributions should
be addressed to:

The Editor,
"Radio and Electrical Review,"
P.O. Box 8022,
Wellington, N.Z.

OFFICES AND LABORATORY:

Radio and Electronics (N.Z.), Ltd.,
46 Mercer Street, Wellington.
Telephone, Wellington, 70-216.

Telegrams and Cables:
"Radel," Wellington.

SOLE ADVERTISING REPRESENTATIVES for THE UNITED KINGDOM:
Cowlishaw and Lawrence (Advertising),
Ltd., 28 New Bridge Street, London, E.C.4.
Telephone City 5118.
Cables: Cowlawads Cent, London.

VOL. 9, No. 8

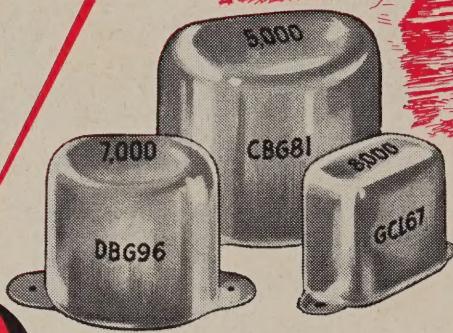
1st OCTOBER, 1954

Contents

	Page
Editorial	19
Two Excellent Portable Circuits for Low-drain Valves	20
Frequencies for "Radio New Zealand"	24
About Power Supplies	26
Tube Data:	
The DM70 and DM71 Subminiature Tuning Indicators	29
Philips Experimenter No. 84:	
A Receiver for the Beginning Amateur (Pt. II)	30
N.Z.A.R.T. Notes	32
Colour Television	33
The Klystron, by Edward L. Ginzton	34
New Zealand Radio-Television and Electrical Traders' Association (Inc.)	37
News from Government Departments	37
Record Talk, by John Gray	38
Commencement of Electrical and Trade Section	39
Radio and Electrical Appliance Marketing:	
Linking Sales and Service, by W. L. Young	39
New Products	42
Book Reviews	44
Summer Time is Portable Time	45
Trade Winds	47
For the Technician:	
Service Instructions for the Philips "Philishave" Electric Dry Shaver, Type 7735.	49
Cromwell Broadcast Receiver, Model 5153	50
Missing and Stolen Radios	52

Sole New Zealand Distributors: Gordon & Gotch (N.Z.) Ltd., Wellington

*They've Stood
the Test
of Time.*



ROLA

ISOCORE

Transformers

Ten years ago this month, Rola researchers were completing laboratory tests on a revolutionary new output transformer — the Isocore.

So advanced was its design that today, with production topping the 600,000 mark, Rola Isocore transformers are still leaders in their field.

Sealed against moisture, fully protected against the corrosive effects of electrolytic action and individually tailored to provide best power transfer and frequency response from the valve with which it is to be used, the Rola Isocore transformer is first choice with all who really know their radio.



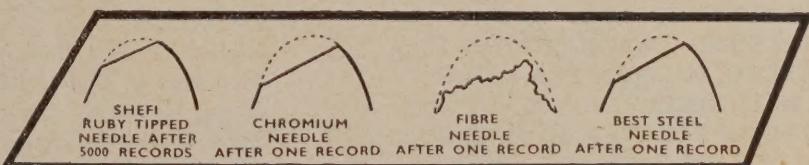
SHEFI ruby and sapphire gramophone needles give consistently high performance in tonal reproduction throughout their long life. Faithful reproduction is assured without undue record wear, with added realism to recorded music. Needle scratch and surface noise are virtually eliminated. Maximum recorded frequency range is fully covered. All needles are precision ground and set in highly polished shanks.

STRAIGHT
for crystal pick-ups

MINIATURE
for lightweight pick-ups.

TRAILER
for heavy pick-ups
and ordinary gramophones.

In addition to the standard range above, Shefi now offer replacement styli for most well-known brands of pick-ups with diamond, ruby, or sapphire jewels.



NEEDLE WEAR—These magnified shadowgraph tracings of needles tested show—e.g., that the finest steel needle is worn more by one record than is the ruby by 5,000.

ruby and sapphire



gramophone needles

New Zealand Distributors: **TURNBULL & JONES LIMITED**

AUCKLAND WELLINGTON CHRISTCHURCH DUNEDIN HAMILTON
PALMERSTON NORTH INVERCARGILL NELSON



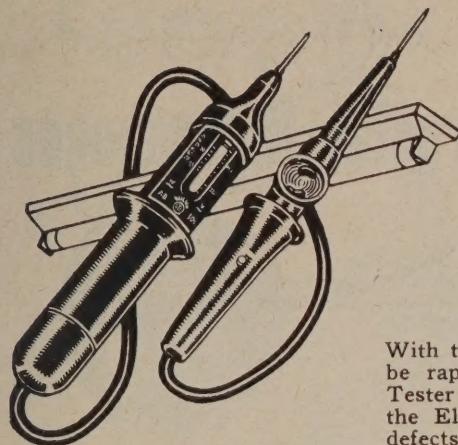
NEW ZEALAND'S LEADING IMPORTERS AND LARGEST STOCKISTS
OF ALL RADIO AND ELECTRICAL COMPONENTS AND EQUIPMENT

Readily available ex stock or on indent are

ADVANCE COMPONENTS LTD.	Signal Generators, Audio Frequency Generators, Constant Voltage Transformers, Attenuators.
AERIALITE LTD.	Aerial Wire, Car Aerials, Electrical Interference Suppressors.
AIRMEC LTD.	Test Equipment and Special Instruments.
BALDWIN INSTRUMENTS LTD.	Industrial Instruments, Radio and Electro-Medical Instruments.
BEHR-MANNING PTY. LTD.	Bear Tape, Bear Dispensers, Bear Box Sealers.
BIRKO ELECTRIC PTY. LTD.	Electric Soldering Irons, Immersion Heaters, Electric Kettles, Percolators.
D. H. BONNELLA & SON LTD.	Low-voltage Switches, Motor-vehicle Switches, Electric Lamp Fittings.
BRITISH ELECTRIC RESISTANCE CO.	Fixed and Variable Resistances, Voltage Regulators, Potentiometers.
BRITISH PHYSICAL LABORATORIES	High-grade Test Equipment.
CLAUDE CAMPBELL & CO.	Sealing Waxes, Compounds, Insulating Materials.
CARR FASTENER CO. LTD.	(Cinch) Plugs and Sockets, Terminal Assemblies, Radio Components.
A. C. COSSOR LTD.	Oscilloscopes, Cameras, and Drive Units, Television Test Equipment, Cathode Ray Tubes.
DAGOLE & CO. LTD.	Wire-wound Resistances.
DAVIS & TIMMINS LTD.	Metal Threads, Nuts, Washers.
ETA TOOL CO. LTD.	Coil Winders.
FURZEHILL LABORATORIES LTD.	High-grade Test Equipment.
GELOSO, SOCIETA PER AZIONI	All Types of Radio and Sound Equipment.
G. M. ENGINEERING (Ottery) LTD.	Circuit Breakers, Heavy Switch Gear, Busbar Trunking, Silvered Mica Condensers.
LONDON ELECTRICAL MFG. CO. Ltd.	Electric Heating Blankets, Pads, and Foot-warmers.
MILLIWATT LTD.	Test Equipment, Movements, Switches.
PATON ELECTRICAL PTY. LTD.	Radio and Electrical Manufacturing Components.
PLESSEY INTERNATIONAL LTD.	Radio Valves, Radio Components, Electric Dry Shavers.
n.v. POPE'S DRAAD—EN LAMPENFABRIEKEN	Piezoelectric Crystal Units.
QUARTZ CRYSTAL CO. LTD.	Copper Winding Wire, Magnets, Loudspeakers.
ROLA COY. (AUST.) PTY. LTD.	Battery Clips, Rivets, and Eyelets.
F.G.S. PRODUCTS PTY. LTD.	Incandescent and Fluorescent Lamps, Spotlights.
STELLA LAMP CO. LTD.	Condensers for every purpose, Interference Suppressors.
TELEPHONE MANUFACTURING CO.	

AND MANY OTHERS





"DULUX" Fluorescent Lamp Tester

SAVE TIME AND LABOUR!

With the Dulux Fluorescent Lamp Tester every electrical part can be rapidly, and efficiently tested ON THE SPOT. The Dulux Tester has been developed as a practical and efficient Tester for the Electrician, giving every possible facility for the detection of defects in Fluorescent Lamps.

Also available Voltage Testers and Pocket Phase Testors.

The natural current consumption of the indicator scale eliminates voltage checking. Special switches are unnecessary and possible sources of error are therefore entirely eliminated.

Trade inquiries to the New Zealand Agents:

A. R. HARRIS COMPANY LIMITED

74-76 MANCHESTER STREET, CHRISTCHURCH



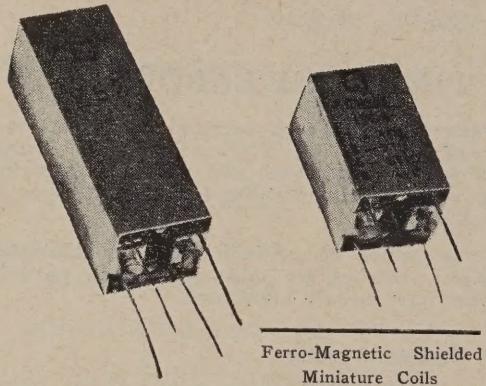
on land sea and air
Whenever there's radio
and television there's world famous —

**ERSIN
MULTICORE SOLDER**



New Zealand distributors: **GILES & ELLIOTT, LTD.** Wellington, Auckland, Christchurch, Dunedin.
Also obtainable from all branches of **TURNBULL & JONES LTD.**

MIGHTY MIDGETS



★Intermediate Frequency Transformer—Type 262 (455 k/c.)

20 per cent. more efficient than other miniatures—six possible band-widths (7.41, 10.8, 11.9, 12, 17.1, 18.81 k/c.) from each transformer—rigid construction—perfect earthing—no limitation of supply voltage—no chance of breakdown—temperature compensated—fully tropicalized—no protruding parts, size fully protects miniature valves during construction or servicing.

★Aerial Type 190A (Standard H.I.P.)

★Aerial Type 200A (Auto tapped)

★R.F. Type 115A (H.I.P.)

★Osc. Type 111AU (ECH35-21 plate tuned)

★Osc. Type 111AV (6BE6—Tapped)

*Full data and I.F. Chart Sheet
on request*

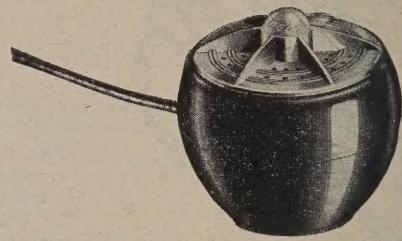
See them at our stockists

INDUCTANCE SPECIALISTS LTD.

"The Coil People"
157 Thorndon Quay, Wellington

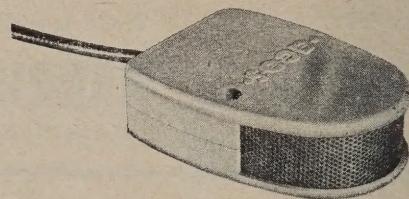
acos

Crystal Microphones



Retail Price 85/-.

Acos Type MIC 33-1
Designed for high-quality public address and home recording fields.



Retail Price 42/6.

Acos Type MIC 35-1
General purpose microphone with high sensitivity and substantially flat characteristic.



Acos Type MIC 36
Series High Sensitivity with omnidirectional pickup field. Attractive contemporary design. Alternative models with or without switch and suitable adaptor for floor or table stands

Retail Price 87/6.

Manufactured by

COSMOCORD LTD.

Enfield, Middlesex, England.

Sole New Zealand Representative:

DAVID J. REID

P.O. Box 2630, 271 Victoria St. West,
Auckland.

Take it like a camera—anywhere



HEAVY DUTY Avo Meter

The Heavy-duty Avometer is a robust instrument made specially for out-of-doors work. It provides 18 ranges of direct reading on a $3\frac{1}{2}$ in. scale. Range selection is by a single rotary switch. An automatic cut-out protects against electrical overload. The Heavy-duty Avometer can be used without removal from its carrying case.

Voltage A.C./D.C.:

10, 25, 250, 1,000 volts.

Current A.C./D.C.:

10 mA., 100 mA., 1A., 10A.

Resistance:

0-500 ohms (midscale 12.5 ohms).
0-50,000 ohms (midscale 1,250 ohms).

Sensitivity:

D.C. voltage ranges:

1,000 ohms per volt.

10-volt A.C. range:

200 ohms per volt.

Other A.C. voltage ranges:

500 ohms per volt.

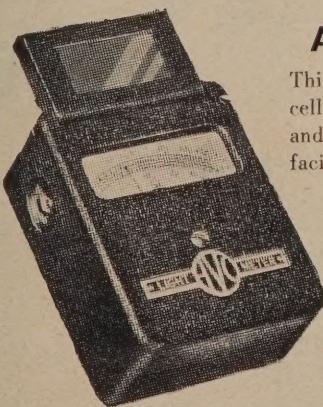
Accuracy:

On D.C., 1% of full-scale value.

On A.C. to B.S., first grade.

AVO (Model 2)

This pocket-size photo-electric cell records in both foot candles and lux units. Very open scale facilitates accurate readings of low values. Cell unit hinged to overcome difficulty of user's shadow causing interference. Reinforced plastic case with zip fastener available.



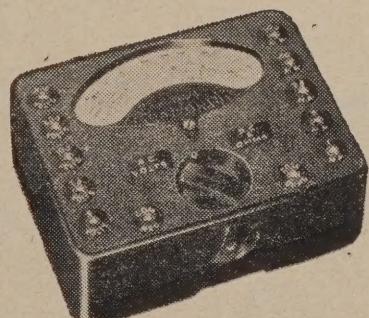
NATIONAL NEECO ELECTRICAL

AND ENGINEERING COMPANY LIMITED

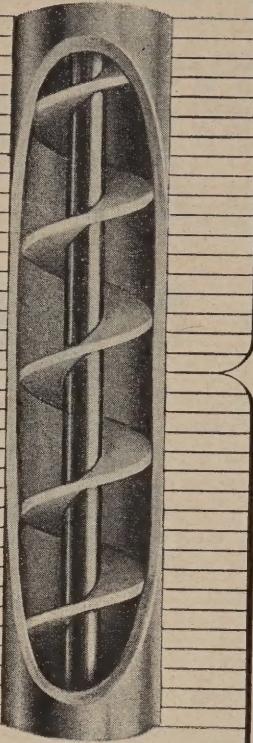
Auckland Wellington Christchurch Dunedin Hamilton
Hastings Wanganui Invercargill

Sole New Zealand Distributors for the Automatic Coil-winder and Electrical Equipment Co. Ltd., London.

THE UNIVERSAL (Model 2) AVO MINOR



Small ($4\frac{1}{4} \times 3\frac{7}{8} \times 1\frac{1}{2}$ in.) but highly accurate, the universal Avometer measures A.C. and D.C. voltage in addition to D.C. milliamperes and ohms. Has 22 ranges. Is suitable also for use as output meter. Accessories available to extend D.C. current ranges upwards and resistance ranges downwards.



HELICAL MEMBRANE COAXIAL CABLES

The Helical Membrane cable was developed primarily for radio-frequency applications to provide a highly efficient construction which would not have the same frequency limitations as disc-spaced cables. The insulation is comprised of a thin Telecothene* tape spirally wound edge-on around the inner conductor. A practical method of achieving this basic form of the insulation was sought unsuccessfully for many years until Telcon succeeded in overcoming the difficulties involved. In the practical form which has been realized, the effective permittivity is as low as that of any commercial form of disc-spaced cable, whilst tests indicate that an extremely high degree of uniformity has been achieved. In combination with an aluminium sheath as an outer conductor and a watertight covering, it has electrical characteristics closely approaching the optimum and yet is mechanically robust and reliable.

FULL ELECTRICAL AND MECHANICAL DATA OF TYPES
AVAILABLE ON REQUEST.

*Telecothene (Regd.) is polythene processed by Telcon to provide specific characteristics.

TELCON  **CABLES**

New Zealand Distributors:

AMALGAMATED WIRELESS (AUSTRALASIA) LTD.

P.O. Box 830, Wellington.

P.O. Box 1363, Auckland.



Magnavox

The quality speaker renowned for dependability and fine performance.

- * Centre pole Magnetic Units
- * Detachable interchangeable Diaphragm Units
- * Positive and permanent alignment assembly
- * Tropic proofed
- * Dust proofed
- * No service problems.

Sole New Zealand Agents

C. R. PEOPLES and CO.

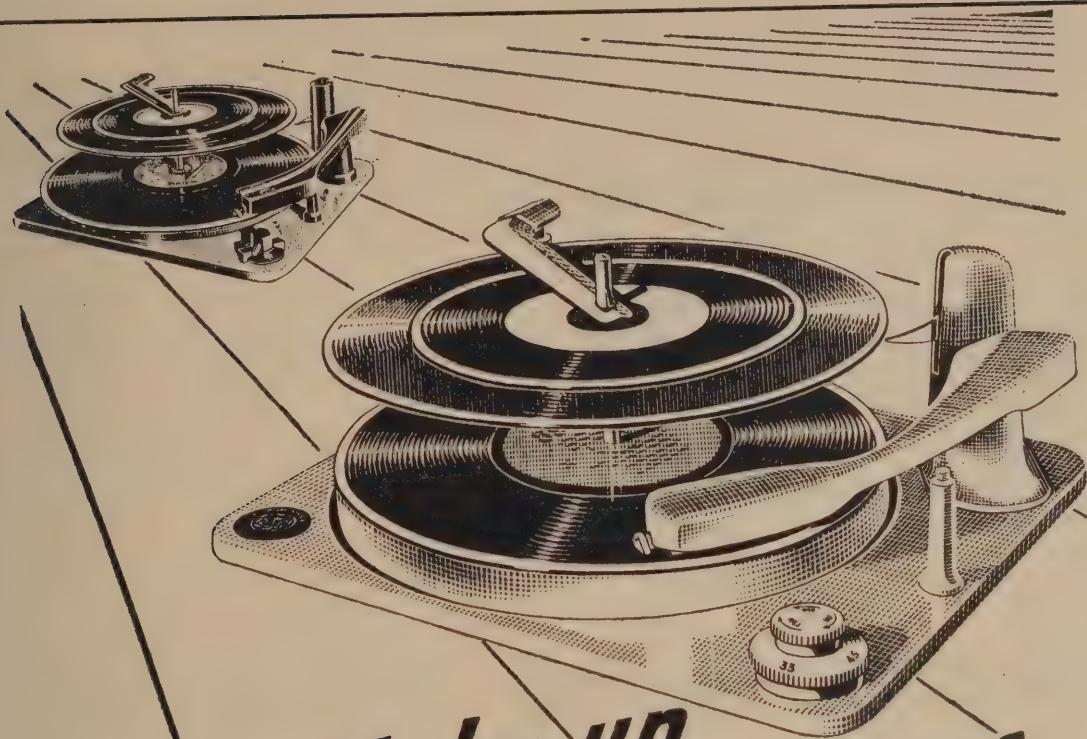
Globe Chambers,

11 Swanson Street, Auckland, C.I.

Telegrams: RELAY, Auckland.

Telephone: 44-333

Distributors: Wellington City and Hutt Valley, Electro-Technical Industries Ltd., P.O. Box 2359, Wellington, South Island, Taranaki, Hawkes Bay, Wellington (exclusive of City and Hutt Valley), W. S. Green & Co. Ltd., P.O. Box 2303, Wellington.



New Make-up for famous features

Everyone knows the Monarch couldn't be better, but the universally acclaimed features have been given a new-look. It's fresher—smoother looking—superfinely finished. In fact it's a new conception that still stars—

- ★ The 'Magidisk'—that exclusive feature of the Monarch that selects any record, any size, in any order.
- ★ The quickest changeover that gives uninterrupted pleasure.
- ★ The hidden music discovered by the BSR dual stylus cartridge.

That is why it is agreed that the Monarch is the World's Finest and most wanted Auto-changer.



WORLD'S FINEST AND MOST WANTED AUTOCHANGER
BIRMINGHAM SOUND REPRODUCERS LTD. ENGLAND

New Zealand Agents:

E.M.I. SUPPLIERS

(Trade Division of H.M.V. (N.Z.) Ltd.)

P.O. Box 296

162-172 WAKEFIELD STREET, WELLINGTON

Phone 54-890

AWA Magictape RECORDER



gives

*High-fidelity Reproduction with
Simplicity of Operation*

- ★ Extremely portable ★ Records anything
- ★ Two channel recording ★ Instant playback
- ★ Complete Erase.

No tracks, no needle . . . no scratch, no wear. Supplied in two models, each complete with microphone, spool of tape and empty spool.

Model ST3: 1 hour recording—tape speed $7\frac{1}{2}$ in. per second.

Model ST4: 2 hours' recording—tape speed $3\frac{3}{4}$ in. per second.

For further inquiries refer to New Zealand Distributors:

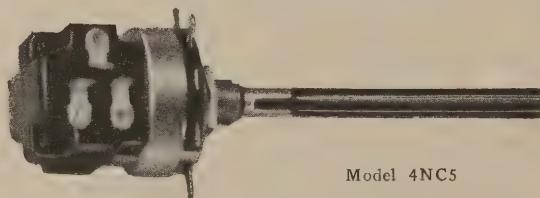
Amalgamated Wireless (Australasia) Ltd.

P.O. BOX 830, WELLINGTON.

P.O. BOX 1363, AUCKLAND.

LESA

VOLUME CONTROLS



Model 4NCS

*The Acme of
Precision Engineering*

Trade Inquiries Invited by Sole New
Zealand Agents:

W. S. GREEN & CO. LTD.,

Telegrams: "Greenage" Telephone 36-929
P.O. Box 2303, Wellington.

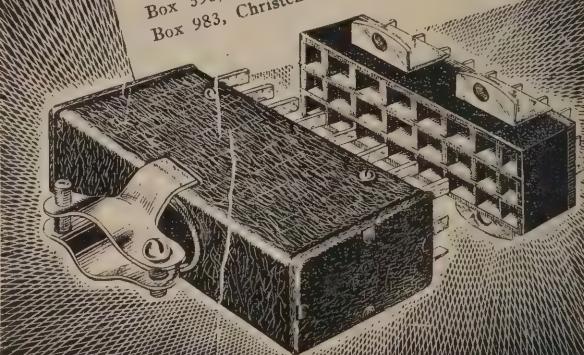
PAINTON
*a name synonymous with
PLUGS and SOCKETS*

Sole N.Z. Agents

STANDARD TELEPHONES & CABLES
PTY. LTD.

Box 571, Auckland
Box 293, Wanganui

Box 593, Wellington
Box 983, Christchurch



Laboratory Notes

from BEACON RADIO LTD.

No. 21

FILTER CIRCUITS

A definition of an electrical frequency filter states that it is a network designed to transmit currents of frequencies within one or more frequency bands and to attenuate or currents of other frequencies. For convenience, frequency filters are often listed under headings such as high pass, low pass, band pass, and band elimination.

The power supply of a radio receiver often includes a combination of chokes and condensers to form a single low pass filter network. Very little thought is given to the design of this section as a filter because

several electrical characteristics associated with filters used in more exacting circuits are of little consequence here. It is of importance, however, to use well designed, well constructed components, and Beacon power supply filter chokes naturally fall within this category.

As a footnote it is worth mention that better filtering may be achieved by using several sections employing moderately sized chokes and condensers rather than using one section and increasing the size of the components.



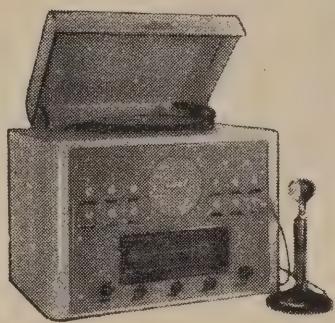
BEACON RADIO LIMITED

Corner BROWN and FITZROY STS. PONSONBY, AUCKLAND. P.O. BOX 2757. TELEPHONES 14-704 13-390

MANUFACTURERS OF ALL KINDS OF
TRANSFORMERS AND FLUORESCENT LAMP BALLASTS

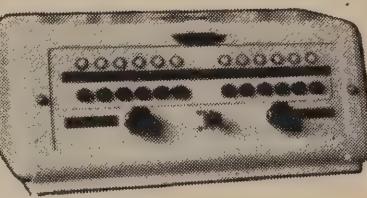


Intercommunication

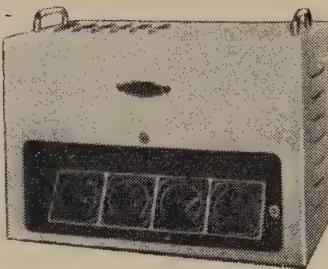


Sound Equipment for Schools

Public Address Equipment



Control Equipment



The ever-increasing demand for greater efficiency in business and industry can be greatly assisted by speedy communication . . . reliable and efficient ULTIMATE communication. The installation of such systems which will save you time and money calls for expert technical advice and skill.

We'll be pleased to advise you on any communication problem. It's no trouble . . . Write to us:

RADIO (1936) Ltd.

P.O. Box 1166, AUCKLAND
Telephone 30-195

NOW—A BETTER, FASTER,
MORE COMPLETE SERVICE
TO THE RADIO AND
ELECTRICAL DEALER

RADIO PARTS, VALVES,
TRANSFORMERS, SPEAKERS,
RECORD-PLAYING EQUIPMENT,
ELECTRICAL APPLIANCES, and
FITTINGS, Etc.

LEADING MANUFACTURERS REPRESENTED—CHECK
WITH US FIRST—PROMPT DELIVERY TO ANY TOWN
OR CITY IN NEW ZEALAND

S. C. DAVISON LTD.
WHOLESAVERS & IMPORTERS.
P.O. Box 279 — Palmerston North — 323A Main St.

E. H. EARL

157 Lambton Quay, (Dunbar Sloane's Building)
Wellington, C.I. Telephone: 46-434.

For all Radio and Electrical Requirements
Jugs, Toasters, Irons, Razors, Heaters, Food-Mixers,
Vacuum Cleaners, Lamps, etc.
Also Agents for Courtenay Radios.

**SPECIALISTS IN A
SPECIALIZED FIELD.**

MR. SERVICEMAN.

Our Universal Coils,
types 40 (Aer), 45
(R.F.) and 41 (Osc.)
will replace any damaged
R.F. Coil.

Inductance Specialists

THE U.S.A. FREQUENCY SPECIALISTS
COILS, LF. TRANSFORMERS,
R.F. COILS, R.F.O.'S, R.F.A.,
SCALES, COIL ASSEMBLIES,
GANGS, BUILD-UP UNITS, ETC.

For Best Quality Components
at a reasonable price

CAMBRIDGE RADIO & ELECTRICAL SUPPLIES
38 Cambridge Terrace,
P.O. Box 6306, Wellington. Telephone: 51-209.

Collaro

TRANSCRIPTION UNITS

The answer to the "High Fidelity fan's" search for a "wow" and "rumble" free gramophone motor. Two models are available, both of which have these features:

- (1) MOTOR: The rotor is dynamically balanced to zero and the tunnel of the stator honed to give uniform air gap consistent with adequate power and silent running.
 - (2) TURNTABLE: Non-magnetic turntable weighing $8\frac{1}{2}$ lb. fitted with a loose rubber mat. Weight displacement of the turntable is arranged so that the majority of the weight is at the periphery, giving a fly-wheel effect. The turntable is fitted with a bush approximately 3 in. long; at the upper end is a steel ball which takes the total thrust on the turntable. This bearing rotates on a ground lapped shaft with a 9/16 in. diameter which is held by a special casting on to the unit plate. This gives turntable speeds which are correct and no speed variation, "wow," or "rumble" are detectable.

**COLLARO TRANSCRIPTION UNIT Model 2000—Motor and turntable, less
Pick-up. £15-8-6**

COLLARO TRANSCRIPTION UNIT Model 2010—Motor and turntable with
Studio "P" Pick-up £ 20-4-2

Russell Import Co. Ltd.

Introducing . . .

THE LONG-AWAITED COMBINATION
RADIO AND TAPE RECORDER

The Latest and Highest Fidelity Unit
introduced to New Zealand

ELCON

RADIOCORDER



SPECIFICATIONS:

RADIO: 7 Valve P.P.

CONSUMPTION: 80 VA with motor running.

TAPE SPEED: $7\frac{1}{2}$ in. and $3\frac{3}{4}$ in. per second.

PLAYING TIME: Half hour and 1 hour on 7 in. spools.

FREQUENCY RANGE: 60-8500 cycles.

POWER OUTPUT: 4 watts.

ERASURE: High frequency.

SPEAKER: Rola 6-9L oval.

FAST FORWARD: FAST REWIND:

WEIGHT: 24 lbs.

INQUIRE FROM

Your Radio Dealer

Or

Trade Inquiries for certain Sole Agencies to:

LOCKHARTS LTD.

P.O. Box 2253, WELLINGTON
P.O. Box 796, DUNEDIN

Fred Rothschild & Son

P.O. Box 170

79-83 Pretoria Street,

present

LOWER HUTT.

ALLGON AUTO AERIAL

Type BT4DL

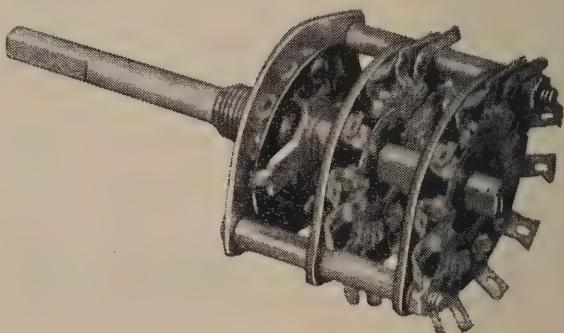


- ★ New Long Life guaranteed antenna.
- ★ Long plastic insulator gives a long leakage path ensuring perfect reception even in wettest weather.
- ★ Adjustable to any angle on cowl.
- ★ 72 in. long—pulls in most distant stations.
- ★ Completely rust proof.
- ★ Low capacity between aerial and chassis.
- ★ Supplied complete with cable and connectors boxed in cartons.

Ask for "ALLGON"
at your stockist

Trade Inquiries Invited

OAK SWITCHES



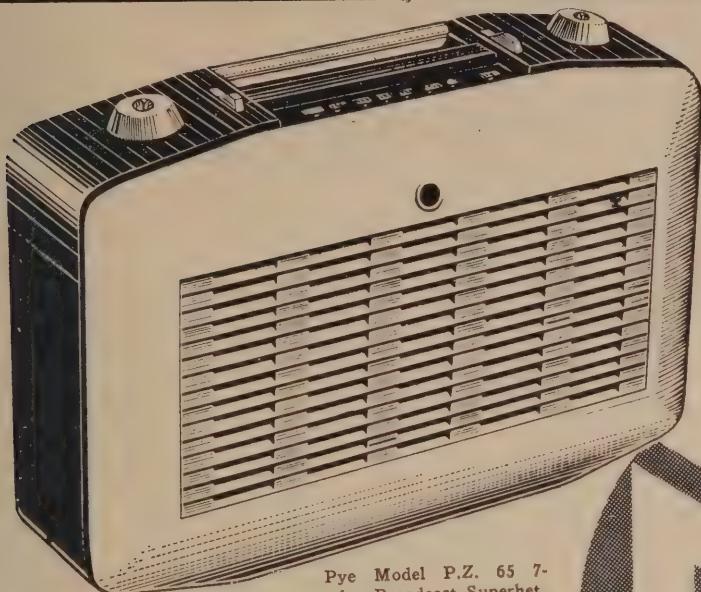
- ★ Made up to your own Specification
- ★ Single Switches or Quantity
- ★ Replacement Wafers or Complete Switches

WISEMAN ELECTRIC CO. LIMITED.

85 VIVIAN STREET, WELLINGTON

P.O. Box 2020

Telephone 55-272



**SELECT
FROM THE
WORLD'S BEST**

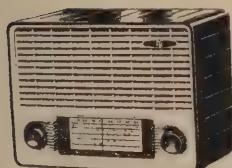
Pye Model P.Z. 65 7-
valve Broadcast Superhet.

THE PERFECT TRANSPORTABLE RADIO

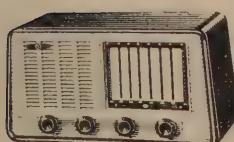


Model '71'
£ 29 | 17 / 6-

The Pye "65" has everything anyone could want in a radio. Plugged into A.C. mains it's a full 7-valve mantel radio—packed with power and proud of its good looks. Carried it becomes a portable with better-than-ever range and tone. The Pye Model "65": 7 valves and an 8 in. loudspeaker; cabinet in composite metal and moulded plastic—only £35 17s. 6d. retail.



Model Y
£ 17 / 17 / -



Model G
£ 32 / 15 / -



Radio and Television

P61.24

Look for the distinctive Pye Trademark at better Radio Dealers every-
where, or for the name of your nearest Pye Agent, write to—

PYE (NEW ZEALAND) LTD.,
P.O. Box 2839, Auckland.

ATTENTION! High-Fidelity Fans

We can now supply the following parts for construction of the High-fidelity synchrodyne Tuner published in September issue of "Radio and Electrical Review."

EF40 Valves	20/-	Rimlock Sockets	1/9
D17 Ferroxcube Pot.	7/6	3-Bank 4-Position Switches	5/-
D25 Ferroxcube Pot.	24/5	600 pfd. Padders	2/6
CG5E Crystal Diodes	7/6	3-30 Philips Trimmers	1/6



Fearn's of Willis Street

31 WILLIS STREET, WELLINGTON, P.O. BOX 1243

BASF MAGNETOPHON TAPE

The Finest Magnetic Tape in the World

Here at last is a two-layer tape that will give complete resistance against dampness and absolute dryness. After prolonged storage, even under moist conditions, it may be repeatedly sharply creased without subsequently tearing or breaking when subjected to undue stress or strain. The reels, made of new Polystyrol, will not crack or warp. Made by BASF, who were the first to develop high-fidelity magnetic recording, Magnetophon Tape owes its remarkable properties to its PVC base. Available in 600 ft. and 1200 ft. reels.

- Increased high-frequency response making higher fidelity possible at lower speeds such as 3½ and 7½ inches per second.
- Greater overall sensitivity (up to 12 db. higher at 1000 c/sec.).
- Breaking strain 2.3 kilograms, or just over 5 lb.
- Permanent stretch at a load of 2.2 lb. is less than 0.04% of the length under strain.



Further details available from sole New Zealand Distributors:

DIRECT IMPORTS (N.Z.) LTD. P.O. Box 72, Hastings

Circuits for Everyone

in the

"R and E" Digest of Circuits No 3

price 3/6

To be Published Shortly

In a digested form, this 96-page book contains basic constructional data on all the equipment described in "Radio and Electronics" and its successor, "Radio and Electrical Review," from February, 1951, to June, 1954, inc. As with the two previous Digests, the scope of this book is extremely wide, ranging from the simplest to the most advanced radio sets, amplifiers, test gear, etc. All essential data are given, together with references to the original descriptive articles which appeared in "Radio and Electronics."

NOTE: None of the material in "Digest No. 3" has appeared in the two previous Digests.

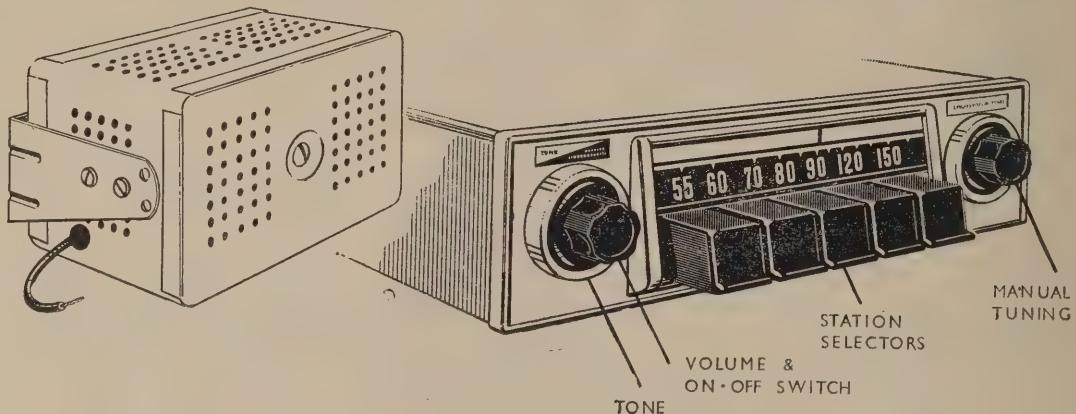
ORDER FROM YOUR NEAREST BOOKSELLER OR RADIO DEALER, OR FROM

RADIO and ELECTRONICS N.Z. LTD.

P.O. BOX 8022

WELLINGTON

Mr. Radio-Dealer . . . we bring you a NEW 'PUSH-BUTTON' AUTO RADIO MODEL 6154A



Look at these LUXURY FEATURES!

- ★ 6-VALVE with R.F. Stage.
- ★ Permeability tuning—5 PUSH BUTTONS.
- ★ Equipped with ELECTRIC SHAVER Outlet.
- ★ Provision for EXTENSION SPEAKER.
- ★ Fitted with 4-position TONE CONTROL.
- ★ 3-PIECE UNIT with elliptical speaker in individual housing.
- ★ Push buttons are INSTANTANEOUSLY set.
- ★ Fits every car.
- ★ Beautifully finished and attractively styled.
- ★ Supplied complete with 4-section cowl-mounted aerial.

SOLE N.Z. DISTRIBUTORS

H. W. CLARKE (N.Z.) LTD.

AUCKLAND — WELLINGTON — CHRISTCHURCH — DUNEDIN

Transistors Or Valves?

It is not very often that a piece of engineering equipment like a vacuum tube, which is in use throughout the world in its millions, is threatened with obsolescence by a new device, working on an entirely new principle, which was invented only six years ago, and yet, if some people are to be believed, this is just what is happening through the advent of the transistor. Wherever transistors are discussed, the question almost always arises whether or not they will completely oust valves from their present pre-eminent position in the electronic world. On the surface, there may seem little reason why, in time, this should not take place, but there are several factors involved which should be taken into account before a considered opinion is given. Indeed, when one considers the tremendous rate at which the development of transistors has already moved, it looks as though it would be a bold man who would dare to forecast what will be their position in the electronic hierarchy even in five years' time. However, making the attempt can be not only interesting, but also instructive, and in five years' time we doubt whether many people will hurl these words in our editorial teeth!

What, then, are the outstanding characteristics of the transistor? And what has it got that valves haven't? If we had to sum it up in a single word, it would be "efficiency." At the outset, it should be clearly understood that transistors can do everything that valves can do, at least so far as fulfilling their functions are concerned. That is to say, they can act as oscillators, amplifiers at audio, video, and radio frequencies, multivibrators, pulse generators, saw-tooth generators, detectors, and, indeed, all the things that valves are now used for. In some cases, they are not as good as valves for a particular application, while in others they are just as good, and in others still they are superior. But in these last cases, their superiority is most often to be found in their higher electrical efficiency. To tell the whole story, one would need to write a book, but there are one or two obvious reasons for the high efficiency of transistors. Perhaps the most important of these is the lack of a cathode which has to be heated so that it can emit electrons. To see just what this means, imagine for a moment a complex piece of electronic equipment like a television synchronizing generator, or a computer circuit. The former is likely to have some thirty to fifty valves, and the latter hundreds or even thousands. At 6.3v. 0.3 amps. for each valve, a hundred of them soak up 189 watts. This may not seem much, but if you are the designer of the equipment, which invariably has to be as compact as possible, and which for preference has to work without such things as forced cooling, the abolition of 189 watts of energy in the form of heat which must be dissipated can certainly make life considerably easier. Valves, when their efficiency is called into question, usually put the best possible complexion on matters by quoting only plate efficiency, or that of the plate circuit, conveniently forgetting that all valves have either filaments or heaters, and that many of them have screen-grids which also use, and dissipate as heat, power from the H.T. supply. Take the case of the ubiquitous 6V6 as an example. Under Class A conditions, as it is normally used as an output valve, the plate circuit draws 40 mA. at 250 volts, a power of 10 watts. The rated power output is 4½ watts, so that the efficiency is 45 per cent., which looks quite good, especially in comparison with the theoretical maximum efficiency of a triode, which is 25 per cent. But if the screen-grid, with 1½ watts, and the heater, at 2.84 watts, are also taken into account, the efficiency is only 32 per cent. A transistor, on the other hand, has a theoretical maximum efficiency under Class A conditions of 50 per cent., and in practice 45 per cent. can easily be achieved.

For low-level work, such as in pre-amplifiers, and for pulsed applications, such as counter circuits and computers, the power advantage of the transistor is even greater. Although it is fundamentally a current amplifier, it can easily be applied as a voltage amplifier, and, here, the heater dissipation of an ordinary valve is many times the power actually handled in the plate circuit. The question of power efficiency is secondary to that of the power used per amplifier stage, and, here, the transistor beats the vacuum tube by a factor at least 200 times, and at best, several more times than this. The extremely minute power required to operate a transistor circuit has been demonstrated by several stunts. One of these is to run an oscillator from a power supply consisting of a pair of coins and a piece of damp blotting paper, the three acting as a wet cell. Another was to run an oscillator from the D.C. power delivered by a photo-voltaic cell when illuminated by sunlight! While it is true that such feats are hardly to be described as directly useful, they do serve to illustrate the extraordinarily low power levels at which transistors will function, and to emphasize that when transistors are used, the power dissipated by them as heat need seldom exceed the few micro-watts power output that is all that is required in many applications.

Another advantage is their extremely small size. In conjunction with their small power requirements, their small physical size makes possible feats of miniaturization that were undreamed of before 1948. Indeed, the possibilities for size-reduction in electronic equipment are to some extent still waiting for reductions in the size of components comparable with the size of the transistor itself.

It should not be imagined that transistors have no disadvantages. Except for developmental models, their operating range is restricted to low radio frequencies. Their noise-level is higher than that of many valves. At present, the collector dissipation, which is comparable with the plate dissipation of a valve, is limited to 100 milliwatts or so, although a transistor has been reported which can dissipate 20 watts. They are temperature sensitive, and their circuit design is complicated by the necessity for stabilizing them against temperature effects. These things all indicate that for many applications transistors cannot yet compete with valves. Unless larger transistors of higher power rating, and others with lower noise-levels, and with much higher maximum operating frequencies, are developed, there are many applications which will never see transistors at all, but it would be ridiculous to think that these difficulties will not be overcome. Those large firms who have already spent millions on transistor development, and who are continuing to do so, clearly must be convinced of the tremendous potential importance of this new device; on the whole, we tend to agree with the English technical writer who has said that those of us who remain un-transistorized in the fast-arriving transistor age might just as well go right back to the Stone Age forthwith!

Two Excellent Portable Circuits for Low-Drain Valves

The two circuits described in this article represent the latest practice in portable design. Main features are the use of the new 25 ma. battery valves, a ferrite rod aerial, and the new DM71 tuning indicator.

INTRODUCTION

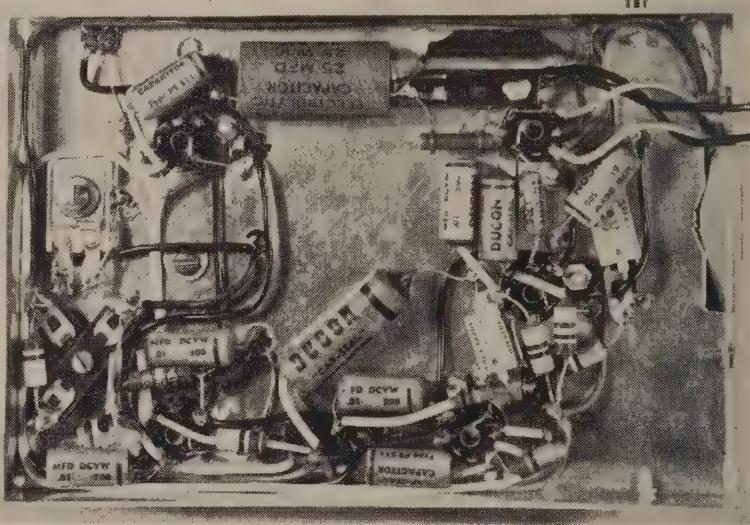
The development of the original miniature battery valves gave a tremendous fillip to the production of battery portable sets, because of their small size and low battery drain, but until recently, there seem to have been few developments which made much difference to the design or performance of battery receivers. In the last year or two, however, developments in valves have made the battery portable a much more attractive proposition than it used to be, mainly on account of the increased battery life which is now possible. It is of little use to produce small portable sets, if the batteries have to be replaced too frequently, both because of the inconvenience of having to do this, and on account of the expense. Thus, any development which enables a substantial saving in battery current to be effected is likely to increase considerably the popularity of the portable set.

The latest battery valves, which were introduced to this country a few months ago, enable the A battery drain of a receiver to be cut almost in half, as the following figures will show. Take a set with an R.F. stage, oscillator-mixer, I.F. stage, detector and audio valve, and output. Prior to the introduction of the low-drain series, the filament current for such a set would have been 300 ma. With the new valves, however, a five-valve receiver will have a filament drain of only 150 ma. The cutting of the filament consumption in half actually increases the battery life by more than a factor of two, because of the peculiarities of dry cells. As is well known, these polarize while in use, and rely on the inactive periods between spells of use for depolarizing themselves. As a result, a reduction in current drawn from the cell does result in a more than proportionate increase in the total time of operation obtained from it, and this effect is more marked, the smaller the cell size.

The new valves also give a slight saving in H.T. current, which tends to increase the life of the B battery, as well as that of the A. For example, the first set to be described in this article—the one with the single DL96 in the output stage, draws only 7 to $7\frac{1}{2}$ ma. of H.T. current when tuned to a local station, and with fresh batteries. With an A battery down to $1\frac{1}{2}$ volts, and the B battery down to 65 volts, the set is still functioning perfectly, and has an H.T. consumption of 7 m.a., when not tuned to a station, and $6\frac{1}{2}$ ma. when tuned to a local signal.

TUNING INDICATOR FOR BATTERY SETS

One very novel addition to these sets is a tuning indicator tube. This is a new development which can be regarded as more than just another gadget. Previous tuning indicator tubes, popularly known as "magic



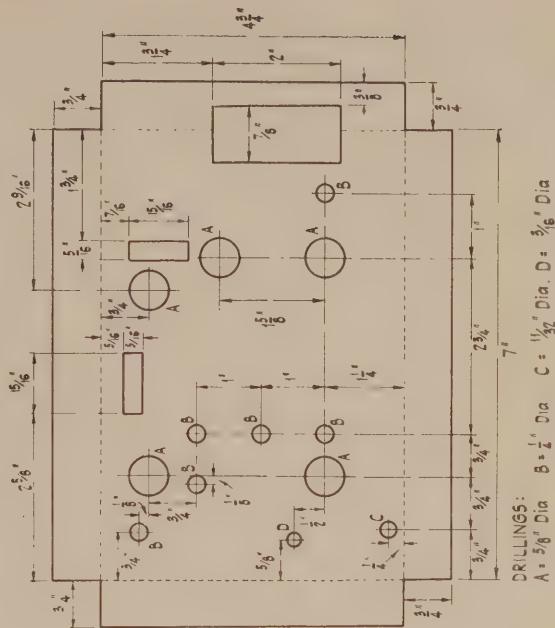
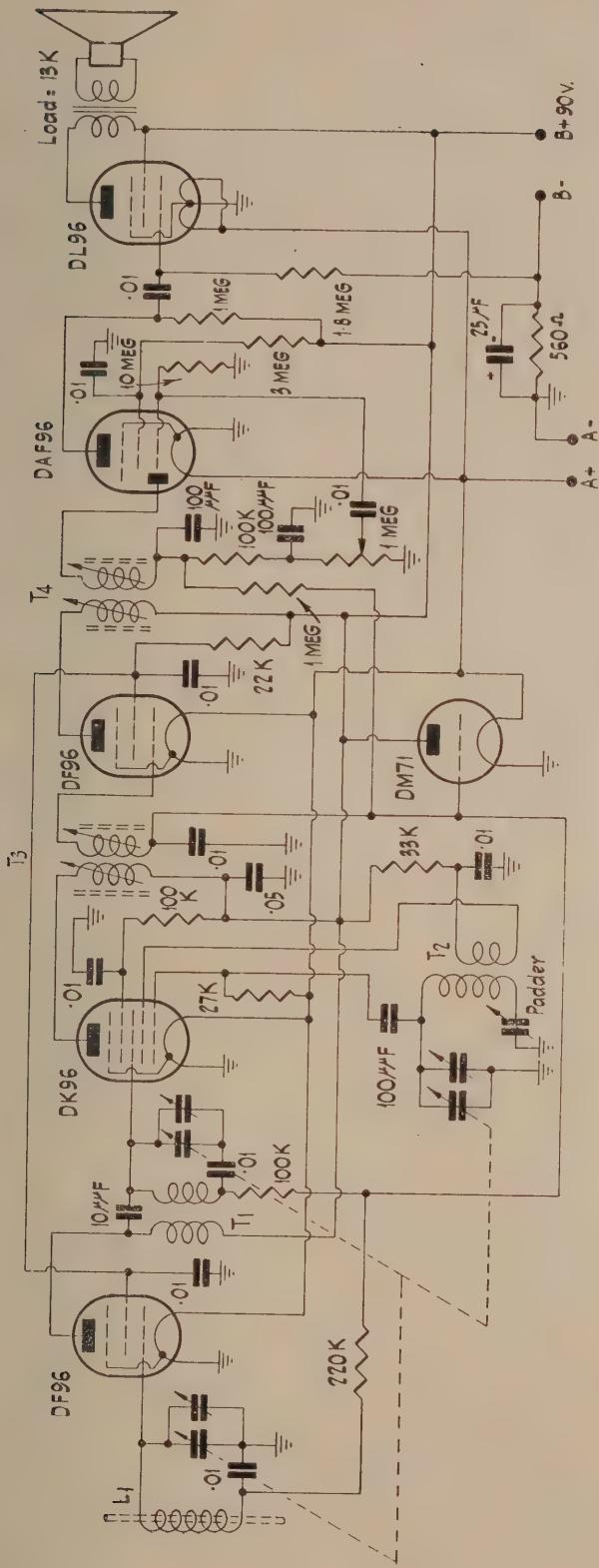
Underneath view of the set shown on the front cover this month. This is the one with the R.F. stage, whose circuit and chassis diagram appear on page 21.

eyes," could not be used with battery receivers, because they required more heater power than a filament-type tube could economically be allowed. The present tube, known as the DM71, works on a slightly different principle, and has a filament drawing only 25 ma. It is a triode, whose grid is connected to the A.V.C. line, just as is done with a magic eye tube, and whose plate is connected straight to the H.T. line. The construction is unusual, in that the "grid" structure has more the appearance of the plate, and, moreover, is to be found surrounding the plate and filament. The "grid" has a slot in it, shaped like an exclamation mark, and through this slot a bright blue glow is seen in the form of a narrow column. With zero bias on the grid, this column is at its longest, but when the grid is biased negatively, the glow becomes shorter, from the bottom up, the upper end remaining stationary. Thus, when a station is being tuned in, one tunes for the shortest length of the glowing column.

Because the column is very narrow, the glow is quite concentrated, and very bright. There is no difficulty at all in seeing it even in the brightest daylight, as it is much brighter than a magic eye tube. Thus, a very important secondary function of the tube is that it acts as an indicator, showing whether or not the set has been turned off. As can be imagined, this can be a great battery saver.

THE ROD AERIAL

Coming increasingly into commercial use is the rod-type aerial, which has similar characteristics to a loop aerial, without its most serious disadvantage.



L₁, red aerial, see text

T_1 , T_2 , standard R.F. and Osc. coils respectively.
 T_3 , T_4 , midget 455 kc/sec. I.F. transformers.

That is to say, it has the same directional pattern as a loop, and can thus be used to reduce electrical interference by turning the set in the appropriate direction. The rod aerial, however, has advantages not possessed by the loop. In the first place, its signal pick-up is greater than that of most loops that are small enough to be used in a portable receiver, so that a set using one has greater sensitivity than a similar one using a conventional loop. Secondly, its Q is greater than most loop aerials, and this gives it greater selectivity, improving the image ratio of the set. This is not so important in a set using an R.F. stage, but is very helpful in improving the characteristics of a set which does not employ one. A third advantage of the rod aerial is that it has only a very small external field, on account of the very small size of its coil. The result of this is that it can be placed quite close to the metallic parts of the receiver without much effect on its signal pick-up. In addition (and this is a most important practical advantage) there is little or no likelihood of instability in the set because of feedback to the loop aerial. Those who have built a few portables will know the difficulty that this can cause. As a rule, shielding is little use, and the only cure is to take the loop aerial farther from the "works." This remedy is usually undesirable, because having to space the aerial from the set often means using a larger cabinet than is otherwise needed. A rod aerial will hardly ever give trouble with feedback. Indeed, with the more sensitive of these two sets (the one with the R.F. stage), it was necessary to poke the end of the aerial rod right into the R.F. coil in order to produce any symptoms at all of regeneration. The rod could therefore be mounted in any position at all. Of course, it does not do to mount it too close to the chassis, and no one would think of attaching it to the side of the chassis, or spaced from it by half an inch or so. In the photograph,

the position of the rod can easily be seen. It is quite close to the set even here, but trials showed that there was no noticeable effect on the sensitivity of the set. Mounting it diagonally like this is useful in that it makes it unnecessary very often to turn the set round in order to orient the aerial in the right direction, and thus obtain the best signal strength. It might be argued that the direction of the rod with respect to the chassis of the set cannot have any effect at all on the signal strength, and neither it can, on its own. It is a fact, however, that most of the houses in this country are built with the walls running almost north and south, and in addition, owing to the geographical lay-out of our broadcast stations, it usually happens that the main stations that we want to receive are roughly in a northerly or southerly direction. Now when a set is put down inside the house, there is an automatic tendency to place it along a wall, which means that the front of the set will run either north and south, or east and west. With the aerial mounted parallel with the front edge, there is more than a chance that it will be oriented in the poorest direction for reception, or at least close to it. With the aerial mounted diagonally, there is much less chance that the station will be on the null point of the aerial's directional pattern.

In spite of this dissertation on the directional properties of the aerial, one should remember that a sensitive receiver with automatic gain control will largely cancel out the effect of the aerial's directivity. The null points, those where the signal pick-up is zero, are really quite sharp, and from a few degrees on either side of them, the A.V.C. is able to bring the output up almost to the same level that obtains when the aerial is oriented for maximum signal. In short, the existence of the null points is not as important as might be expected. If this were not so, loop and rod aerials would not now be so popular in sets other than portables.

THE CIRCUITS

The first of the two circuits described here has been designed for high sensitivity, for use in areas where the signal strength from the majority of the stations is not high, or when reception of distant stations is required. The H.T. is 90 volts, and with the DL96 output stage, this gives an audio output of approximately 0.1 watt, which is quite adequate for a portable.

A DF96 is used as an R.F. amplifier, and this, together with the excellent characteristics of the DK96 mixer valve, is largely responsible for the excellent sensitivity. In common with practically all modern portables, the set uses back bias for the output tube, grid-leak bias for the audio amplifier stage, and zero bias for the R.F. mixer, and I.F. stages. Since the maximum allowable screen voltage is less than 90 volts on these tubes, it is necessary to use screen dropping resistors for the DF96s and the DK96. The circuit is quite ordinary, however, and requires little comment. As the rod aerial is used in exactly the same way as a loop, the circuit is no different from that of sets using a loop.

The method of connecting the DM71 indicator tube is illustrated in this circuit, and is very simple. The plate is taken directly to the H.T. line, and the grid to the A.V.C. line, and no additional components are needed. There is, of course, no necessity to add the tuning indicator to the set unless it is particularly wanted, and it is a simple matter simply to omit it from the circuit.

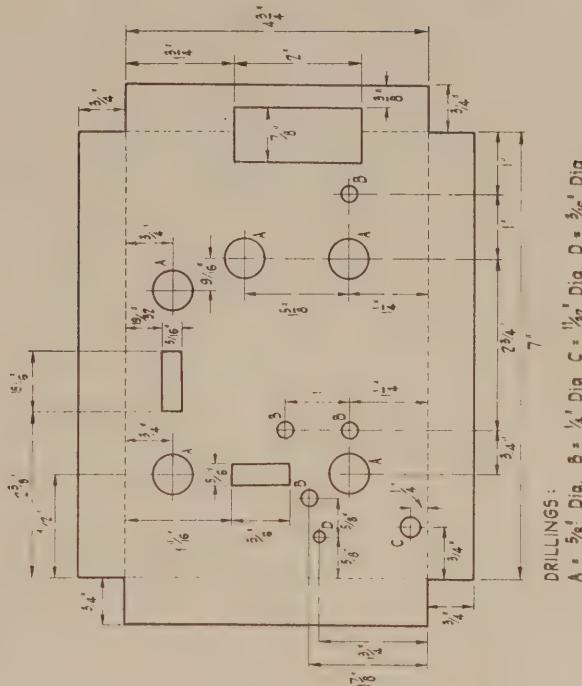
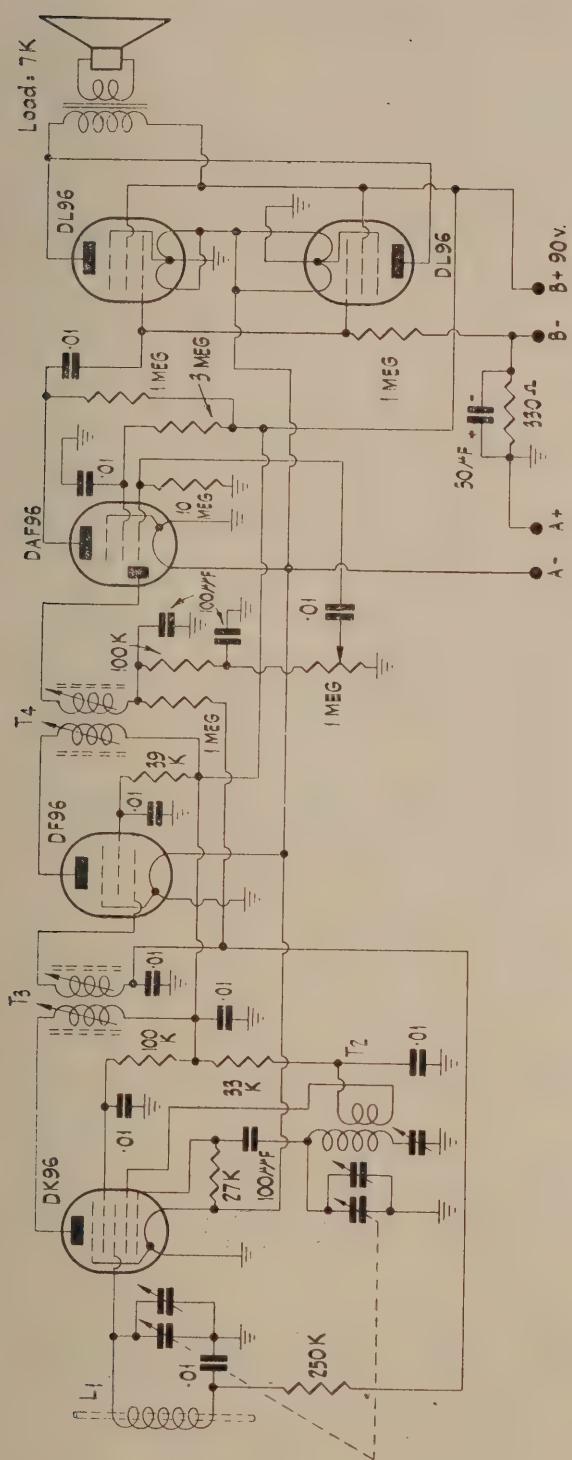
The second circuit also uses five valves, but is intended for use by those who would like a little more audio output, and who are not exercised about obtaining the greatest possible sensitivity. Accordingly, the R.F. stage is omitted, and the fifth valve is an additional DL96, in parallel with the other one. The question of a push-pull output stage was considered, but it was thought that in a portable, using the two output valves in push-pull did not confer enough advantage to make it worth while. The main difficulty would have been one of providing the push-pull driving voltages for such an output stage. Unless an additional valve were used as a phase inverter, making the set a six valve one, the only practicable method would have been to use a transformer-coupled audio stage. This would add considerably to the bulk and cost of the set, for very little practical advantage. By using two valves in parallel, the same output can be obtained as the push-pull stage would give, namely, 0.2 watts, or twice the output of one valve. The parallel output stage does not involve any additional components other than the valve itself and a socket for it, and so is a most inexpensive way of increasing the set's power output.

Apart from this, and the omission of the R.F. amplifier stage, the two circuits are almost identical. Readers should note, however, that some of the resistors' values have been changed. The most important alteration is the change in the back bias resistor. This is not exactly one half of the original value, as might be expected, because the H.T. current of all the valves in the set flows through the back bias resistor, so that changing the front end has its effect on the value needed for the bias resistor. About the only other alteration is that the screen dropping resistor of the I.F. amplifier is considerably greater in the circuit without the R.F. stage, because this dropping resistor no longer has the screen current of an R.F. stage flowing through it as well.

CONSTRUCTION

The set whose photographs are reproduced here is the one with the single output tube and the R.F. stage. The three-gang tuning condenser used in the set is one which has a small dial and its reduction drive built on to it, so that the dial and condenser gang are bought as a single unit. This is a most compact affair, occupying very little head room, and ideal for portables, as well as for its original purpose, which was for home-built car sets. The gang has the further advantage that the trimmers are built in also, effecting a saving in components and in space as well.

The front socket, on the right-hand side of the set is for the R.F. stage, while immediately behind it, right at the back of the chassis is the DK96 socket hole. Then along the back of the chassis come the first midget I.F. transformer, the DF96 I.F. valve, and the second I.F. transformer. Directly in front of this is the DAF96, and in front of it in turn is the output tube. The space in the right-hand back corner of the chassis is reserved for the output transformer, and the cut-out in the right hand side of the chassis is to accommodate the 3-inch speaker itself, which is also mounted on the chassis. In order to save space, the chassis is made very shallow—only $\frac{3}{4}$ in.—while still leaving plenty of room for those parts which are mounted under the chassis. This is possible because all the parts other than resistors and bypass condensers are mounted above the chassis. It was not found necessary to use shielded coils, owing to the restricted field of the rod aerial, and this is an additional space saver.



Circuit and chassis diagram for the second set. L₁, T₂, T₃, and T₄ are the same as for the other set.

The lay-out described gives short leads in every part of the circuit, except for those to the volume control potentiometer, which are shielded in the usual way. The potentiometer is mounted on a small bracket at the front of the chassis, in the space between the output valve and the speaker. As can be seen from the under-chassis photograph, wiring is done as far as possible on the point-to-point method, helped out where necessary by insulated soldering lugs mounted on the chassis. The subminiature socket for the DM71 is mounted close to the front edge of the chassis by carefully filing the mounting hole so that the socket is a tight push fit. The position was chosen so that the indicator tube, the tuning knob and the volume control shaft are symmetrically disposed. A small slot in the cabinet is all that is needed for viewing the indicator tube, and this will correspond on the left side of the set to the position of the volume control shaft on the other side.

The second chassis diagram gives a suitable layout for the set with the parallel output stage and no R.F. stage. It will be noted that the valve socket holes are in the same positions as before, and all that has been changed is the position of the I.F. transformers. The valves have all been moved round one place to the left, so that the oscillator-mixer now occupies the same position as did the R.F. valve in the other set, and the I.F. tube occupies the position previously held by the mixer valve. The detector and audio moves round to take up the position previously occupied by the I.F. tube. This leaves the extra socket hole at the output end of the set, and the additional output tube is put there. The output transformer and volume control are in the same positions as before. There will be a little free space in this

set behind the gang condenser, since the two-gang version will be shorter than the three.

The rod aerial does not come ready made. The Ferroxcube rod does, of course, so that the job of fabricating the aerial consists only of winding a suitable coil for the rod. The latter has been found to fit quite well into ordinary half-inch bakelized cardboard coil-former tubing, so that the job of winding the coil is made easy. A short length of the tubing is cut off, and two rivet-end solder lugs are riveted to it about one and a half inches apart. These are for terminating the winding. The latter consists of only 41 turns of 27-gauge enamelled wire, close-wound on the former, with the ends soldered to the previously mounted lugs. Two pieces of hook-up wire are also soldered to the lugs to act as leads to the circuit. This should be twisted together and taken, one to the stator lug of the front gang section, and the other through a hole in the chassis, to the solder lug on which the A.V.C. bypass condenser is terminated. When the set comes to be aligned, the inductance of the aerial winding can be trimmed by sliding the former a little way along the rod. The greatest inductance is obtained with the coil exactly in the centre of the rod, so that if the inductance is found to be a little too great, sliding the coil will reduce it without making it necessary to take off any turns. However, the characteristics of the aerial rods are very uniform, and we do not think that it will be necessary to make any alteration to the coil, as specified.

ALIGNMENT

The use of the aerial rod instead of a loop does not make the set any different to align. The padder is adjusted at the low-frequency end of the dial, and the trimmers at the high-frequency end, just as usual. A check on the inductance of the aerial coil can be made by tuning the set to about 600 kc/sec., and finding whether the aerial trimmer needs to be increased or decreased in order to obtain greatest sensitivity. This is the same frequency that is normally used for adjusting the padder so that what we have to do is to check that the aerial circuit is tuned to the same frequency as the R.F. coil. If it is found that an increase in the aerial trimmer

brings up the signal, then the aerial coil's inductance is too small, and vice versa. It should be remembered when using this check, however, that the aerial trimmer should *not* be left peaked at 600 kc/sec. The trimmers must always be adjusted at the other end of the dial, namely at 1400 kc/sec. Another check for the aerial inductance is to bring a small closed loop of wire over the end of the aerial rod. This will act as a shorted turn, and will decrease the inductance. If doing this is found to bring up the volume, when the set has been aligned and the check is carried out at the low frequency end of the dial, it means that the aerial inductance is too large, and should be adjusted accordingly. However, this check can be regarded as a refinement, as the set will be found to function perfectly with the aerial winding made as specified.

In conclusion, we would urge anyone who has not tried this new series of valves, or the Ferroxcube aerial rods, to "have a go" at this set. We will almost guarantee that its performance will be found astonishingly good. In our laboratory, in the centre of the Wellington business area, where the noise level is notoriously high, it is possible to hear 4YA quite plainly in the daytime, whereas on any ordinary set, using the outside aerial, it is almost impossible to tell that it is there. Under the same conditions, 3YA comes in well enough to have entertainment value, whereas it is quite unlistenable on an outside aerial. This performance is directly attributable to the high sensitivity of the set, combined with the fact that the rod aerial makes it possible to "D/F out" a large proportion of the interference. If you don't believe us, try the set and see, and our guess is that you will be as astonished at its performance as we were.

FREQUENCIES FOR "RADIO NEW ZEALAND"

The New Zealand Broadcasting Service announces that, as from Friday 10th September, 1954 (N.Z. date), "Radio New Zealand will operate on the following frequencies:—

To Australia:

1800-2145 GMT	ZL18	9.52 Mc/s in 31 metre band
2200-0545 GMT	ZL19	11.83 Mc/s in 25 metre band
0600-Close-down	ZL18	9.52 Mc/s in 31 metre band

To Pacific Islands:

1800-2145 GMT	ZL7	6.08 Mc/s in 49 metre band
2200-0445 GMT	ZL3	11.78 Mc/s in 25 metre band
0500-Close-down	ZL7	6.08 Mc/s in 49 metre band

Close-down is at 1045 GMT on week-days.

Close-down is at 1120 GMT on Saturdays.

Close-down is at 1000 GMT on Sundays.

BACK NUMBERS OF "R. & E."

Available from our Office,
P.O. Box 8022, Wellington.



PHILIPS POCKET
BATTERY MONITOR

Reasonably priced.



PHILIPS ELECTRICAL INDUSTRIES OF N.Z.
LTD. P.O. BOX 2097, WELLINGTON.

ANNOUNCEMENT

P. R. MALLORY & CO. INC., of Indianapolis, Indiana, U.S.A., have formed in Australia a wholly-owned subsidiary, P. R. MALLORY & CO. PTY. LIMITED, for the purpose of the latter Company engaging in Australia and New Zealand in the manufacture, promotion, and sale of "MALLORY" products and materials.

P. R. MALLORY AND CO. PTY. LIMITED (Australia) have acquired 136,000 fully-paid 10/- Ordinary Shares in DUCON CONDENSER LIMITED of Sydney at a premium of 2/3 per share. (This shareholding represents 25% of the Issued Ordinary Capital).

Under the agreement, DUCON CONDENSER LIMITED secures the exclusive rights for the sale and promotion in Australia and New Zealand of "MALLORY" products, and also acquires the manufacturing rights, technical data, and know-how in respect of "MALLORY" Capacitors, Resistors, Potentiometers, Timer Switches, Television Tuners, and other Electronic products, including those which will be developed in the future.

The Directors of the new Company are:

PHILIP R. MALLORY, Chairman of the Board of P. R. Mallory and Co. Inc.

JOSEPH E. CAIN, President, P. R. Mallory and Co. Inc.

CLIFFORD S. GITTOES, Managing Director, Ducon Condenser Limited.

JAMES OGILVY Director, Ducon Condenser Limited.

RUSSELL W. R. WILTSHIRE Assistant Manager, Ducon Condenser Limited.

The Agreement with the "MALLORY" organization will be implemented in New Zealand by DUCON (N.Z.) LIMITED of Wellington, a subsidiary of DUCON CONDENSER LTD., Australia.

This new relationship of MALLORY with the DUCON organization comes at a time when considerable activity is expected in Australia and New Zealand in preparation for the introduction of Television. Significant, too, are the benefits that will be derived under the agreement, from the point of view of electronic equipment for defence purposes.

The New Zealand Company has recently purchased and is in the process of removing to a 18,000 ft. building in Wright Street, Wellington.



DUCON (N.Z.) LTD., WELLINGTON

DUCON
Capacitors

Works: 26 Wright Street, Telephone 52-905. Office: 21 Grey Street, P.O. Box 630, Telephone 42-411.

ABOUT POWER SUPPLIES

Better dynamic characteristics means better output on CW, AM and SSB.

(Reproduced from G.E. "Ham Tips")

What is dynamic regulation in a power supply? Because the literature in this field is exceedingly sparse, perhaps a good way to start is to take two common definitions and directly relate them to the subject at hand, thus:

Static—Relating to forces in equilibrium (as d-c plate voltage and current in a rig transmitting a continuous unmodulated carrier).

Dynamic—Relating to moving forces (as d-c plate voltage and current under typical operating conditions in the average amateur **CW, AM or SSB rig**).

Keeping these definitions in mind will help in understanding just what goes on inside the conventional plate power supply which ordinarily consists of a centre-tapped step-up transformer, rectifier tubes, and a two-section choke-input filter to reduce ripple. Since such supplies have been used since the introduction of the mercury-vapour rectifier, one might think that just about all the "bugs" would have been smoked out by now. Well, many bugs have been eliminated and, as a consequence, manufacturers of transformers and chokes now proudly offer what they term "matched power supplies"—sets of components for which they publish ratings, voltage regulation curves, and ripple output to be expected. These "matched" components make up power supplies that do perform as the published data indicate.

LOSS OF VOLTAGE

However, poor **dynamic** regulation in these conventional power supplies means distortion of signal output—alteration of actual radiated intelligence—almost without exception in **CW, AM and SSB rigs**. These faults exist no matter how good a **static** regulation figure is indicated by d-c input instrumentation. This comes about in the conventional power supply because transient oscillations excited in the filter rob the rig of voltage during a sizable portion of the time it is sorely needed. Hams who light-heartedly pass this effect off as "instantaneous," thereby implying it is of no consequence, may want to examine their power supplies more critically after studying the test data presented below.

Consider the meaning of the voltage regulation curve usually given for the ordinary rectifier-filter combination. This is a "static" curve, obtained by loading the supply to certain currents, reading the voltages across each load, and then plotting the results. Such a curve is useful, but it tells us only what the **average** voltage will be at any **average** current value—because the instruments used to measure these values respond only to **average quantities**. Figure 1 shows just such an acceptably good regulation curve in which the voltage drops about 10% or so from no load to full load on an **average** basis.

But is it the average load, voltage, and current alone that we are interested in? What kind of loads do our amateur transmitters present to their respective power supplies? Do we transmit intelligence with average loads—or with a complex pattern of instantaneous loads.

VOLTMETER MISLEADING

Consider the final stage of a **CW** transmitter. At key-up the load is zero, or, at most, a rather small one. When the key is closed, the maximum load current is drawn. Now does the power supply follow the same curve that was plotted under static or slowly varying loads? An ordinary voltmeter might lead one to think so.

But look at Figure 2! This is a photograph of a cathode-ray oscilloscope which shows how the voltage varies with time in the ordinary power supply when the load is suddenly applied as in keying a **CW** rig. The solid upper line shows the no-load output of the supply—820 volts; the lower solid line represents zero volts. The lower waving line is a 60-cycle timing wave which permits reading the actual load voltage (represented by the upper oscillating line) at any fraction of a second from the instant the load was applied. The spot on the oscilloscope was started as the key closed to a 200-milliamperes load. (The steady current rating on the test supply is 250 milliamperes.)

Note how the load voltage dips suddenly to less than a third of the no-load voltage line, then wildly overshoots the line and oscillates about until it finally settles down to the average loaded voltage of 760 volts—which is the same as the static loaded output voltage shown in the curve of Figure 1 for a 200-milliamperes load.

Incidentally, the ripple under load is visible on the right-hand portion of the load voltage curve of Figure 2, but is fairly small compared with the extravagant excursion of the voltage in the period immediately following the application of the load.)

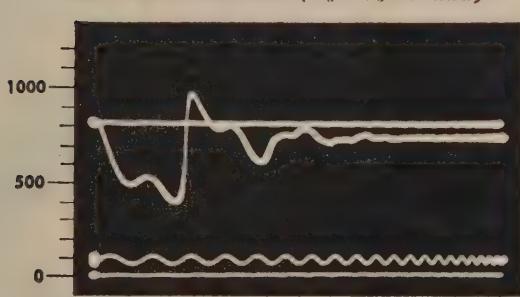
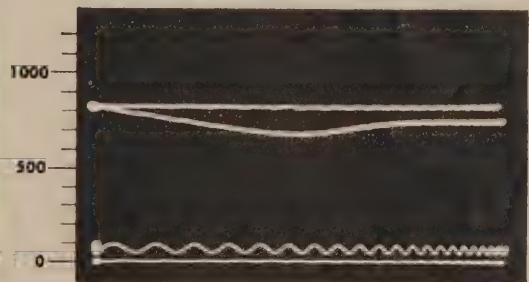
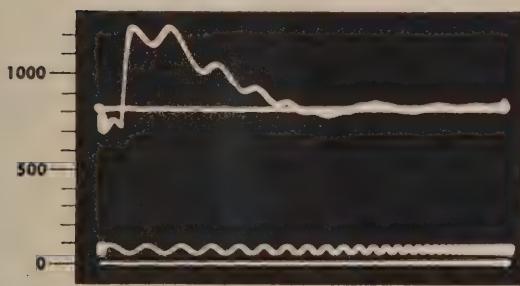
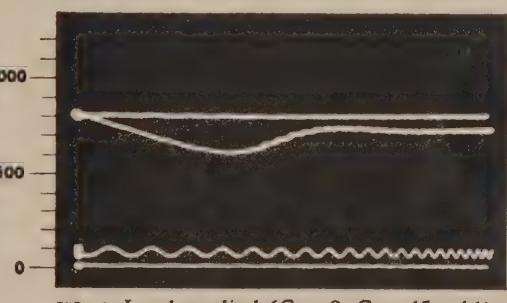
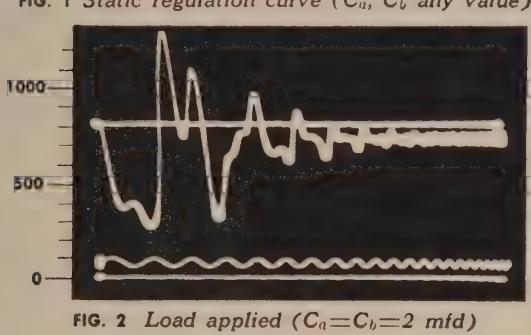
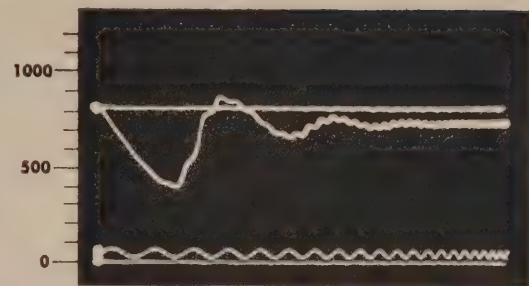
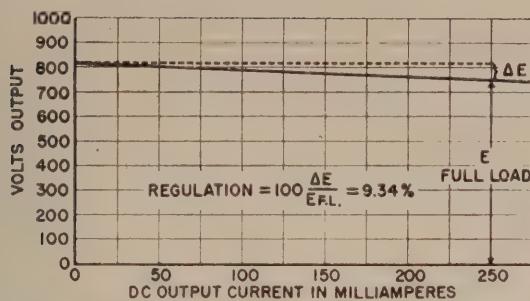
A d-c voltmeter that was connected across the line at the same time merely dropped from 820 to 760 volts and gave no indication of the actual turmoil immediately after keying!

EFFECT ON CW OPERATION

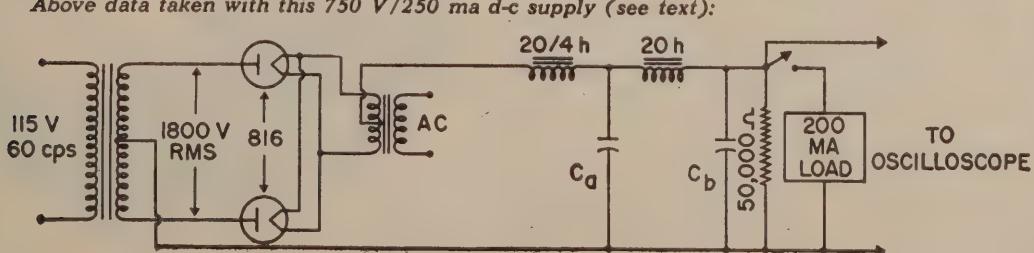
Is this turmoil anything to worry about? Well, the final stage in a **CW** transmitter generally runs Class C, and the transient oscillation shown across the power supply modulates each character with that same wave form quite independently of any keying filter that may be provided for click reduction. This, then, is the signal envelope—somewhat poorer than ideal!

How long is a dot or a dash in seconds? That depends on the operator for the most part, of course. But this transient oscillation certainly lasts for a considerable portion of the average CW dot or dash, because as can be seen from the timing wave of Figure 2, the voltage does not settle down to a steady ripple until more than a tenth of a second has elapsed. And as anyone who has played with timing in radio or photography work knows, a tenth of a second is far from what is normally thought of as "instantaneous."

When the load is removed (key up), the power supply voltage behaves as photographed in Figure 3—another wild peak, with the oscillation finally settling down to the no-load line. Of course, in this case there



Above data taken with this 750 V/250 ma d-c supply (see text):



is no "on the air" effect, but the filter condensers and all other connected equipment are subjected once again to this voltage turmoil. This may explain why every once in a while a ham's whole rig is blown to kingdom come when he shuts it off.

The oscillograms shown apply only to single keying actions. Fast keying conditions intensify the transients shown in Figures 2 and 3.

EFFECT ON PHONE OPERATION

So much for CW loads on the common garden variety power supply. Now before the phone men start laughing up their sleeves at their brass-pounding brethren with "hand-modulated" rigs, let's take a close look at Class AB₁, AB₂, and B modulators operated with conventional power supplies.

It is characteristic of these modes of operation to draw average plate current which is a function of the modulating signal. Thus, the modulator load is similar to the on-off type of load experienced in a keyed CW transmitter, and the power supply transient so induced can be a real hazard to good quality. Because of the relatively sluggish action of a d-c plate current instrument (which tends to indicate current flow averaged over about half a second or so) the actual cyclic or syllabic transient load presented to the power supply is much greater than one would be led to believe by just reading the plate milliammeter.

What happens when the power supply behaves as in Figure 1? The answer is high distortion and loss of required peak power because most of the supply voltage just is not there part of the time it is needed by the modulator, and so the modulator tubes cannot draw the peaks of plate current that the grid drive on the modulator stage says should be drawn.

And remember, distortion tests made with steady tones will not show this "dynamic" distortion because the drain on a power supply induced by a steady tone is constant when averaged over one-half of the period of the test tone wave—relatively short compared to a filter transient which lasts more than a tenth of a second.

EFFECT ON SSB OPERATION

Single-sideband transmitters employing Class AB₁, AB₂, or B RF stages present the same type of load to their respective power supplies—and, as a result, also introduce considerable distortion in the radiated signal.

About the only types of emission in common use which do not suffer "on the air" losses as a result of transient filter oscillations are NBFM and FSK. (No transients are excited in the filter because the load is steady). Linear amplifiers used with AM signals overcome this dynamic power supply regulation problem, but the carrier efficiency of this mode of operation is so low that use of linear amplifiers in amateur AM transmitters is not common. Similarly, constant current (or Heising) modulation for AM is another case where dynamic power supply regulation is not of primary importance. Grid modulations systems—control, screen or suppressor—also side-step the dynamic regulation problem but are inherently low-efficiency systems at best. In all these modes of operation, the only important power supply considerations are adequacy of rating and ripple filtering.

What can be done to improve the dynamic regulation of the conventional power supply? Let us follow

the steps that were taken in the shack of W2KUJ to attack the problem.

It became apparent that merely improving the ripple attenuation by adding more filter sections affected the dynamic regulation very little. So the first step was to increase the capacity of the existing filter from 2 Microfarads to 5 microfarads per capacitor. The result appears in Figure 4—which shows excellent ripple filtering but only slightly reduced voltage excursions as compared with the transient of Figure 2.

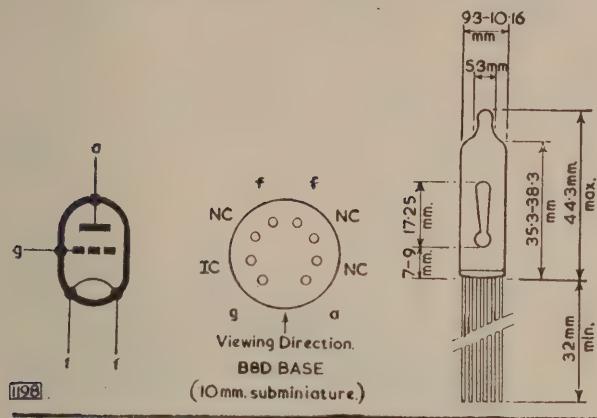
Next, the two 5-microfarad capacitors of the two-section filter were connected in parallel to make a single-section filter (with the two chokes left in series). As shown in Figure 5, the voltage excursions are not greatly changed in magnitude, but have a less complex pattern—comparable, in fact, to that of a simple damped oscillation. But here again, the oscillation is excited in the filter by the suddenly-applied load.

The next step in the test was to use 45 microfarads of capacity as the final element of the filter. The dynamic regulation performance responded nicely, as shown in Figure 6. Note the reduction of magnitude of voltage swing and lowering of the resonant frequency of the filter as compared with Figure 2, 4 and 5.

FINAL DESIGN

This encouraged a final design in which 90 microfarads of capacity rendered the curve shown in Figure 7. Here the dynamic regulation is just slightly greater than the static regulation, which, incidentally, measures 9.34%—quite good enough for almost any amateur transmitter. The "break" characteristics of this final design are pictured in Figure 8. Use of more capacity would improve the dynamic characteristics of the power supply correspondingly because the resonant frequency of the filter would be lowered even farther.



Tube Data**The DM70 and DM71 Subminiature Tuning Indicators**

1198

1199

These two new tubes represent an entirely new development in the way of tuning indicators. Their most novel feature is that they can be applied to battery portable sets, on account of their low current requirements, both on the filament and plate. They are similar to the familiar magic eye tube only in so far as both types employ a cathode-ray glow for obtaining their visual effect. The DM70 and 71 are triodes, in which the "grid" is a structure which surrounds the plate. It is the latter which glows, and the glow is observed through a slot in the surrounding grid structure. The slot is in the shape of an exclamation mark, and the glow is visible as a vertical column, whose length varies according to the bias voltage on the grid. The plate, in the case of battery applications, is connected directly to the H.T. line, without a plate load resistor, while the grid is connected straight to the A.V.C. line of the receiver. The upper end of the glow remains in the same position, and as a signal is tuned in, the length of the glowing column becomes shorter. Thus, one tunes for the minimum glow length.

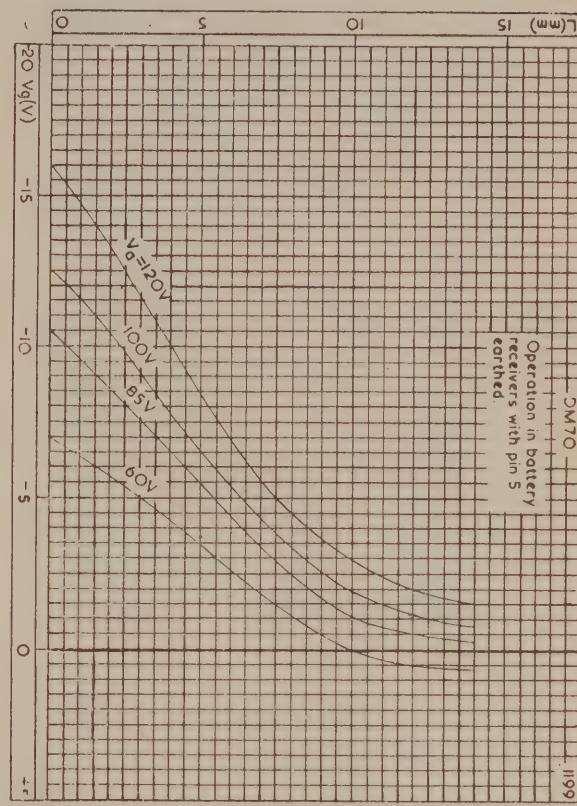
DIRECTLY HEATED CATHODES

The tubes have a low-drain filament, rated at 25 ma. at 1.4 volts, so that the addition of one to a battery receiver makes only a negligible difference to the total filament drain. For application to A.C. sets, however, it is possible to run the filament from the 6.3 volt heater winding, with the aid of a dropping resistor of 220 ohms, 1 watt. In mains-operated sets, the plate circuit should be fed through a dropping resistor, according to the following table.

H.T. line Voltage ...	110	170	250	volts
Plate resistor	0.47	1.0	1.8 megs.

In battery sets, a grid voltage of — 10 is required for complete extinction of the glow, while with 110, 170, and 250 volts, in conjunction with the recommended plate resistors, grid voltages of — 15, — 23, and — 35 volts respectively are required for complete cut-off.

The H.T. current drawn by the tubes is greatest when directly connected to the H.T. line, as in



Graph of length of the glow versus grid voltage for three values of plate voltage.

battery set operation, when it is 0.17 ma. In the other conditions of operation, the plate current is approximately 0.11 ma.

DIFFERENCES BETWEEN THE TWO TYPES

The only difference between the DM70 and the DM71 is that the latter has short leads, of the correct length for plugging into the B8D subminiature 8-pin socket, while the former has long leads for direct wiring to the circuit.

For all Tape Recorders

EMITAPE

Another famous E.M.I. Product
obtainable from
E.M.I. SUPPLIERS
P.O. Box 296, Wellington

The PHILIPS Experimenter

An advertisement of Philips Electrical Industries of N.Z., Ltd.

No. 84: A Receiver for the Beginning Amateur (Part II)

Reprints of these EXPERIMENTER articles, complete with illustrations, will be mailed to any address for one year for a subscription of 5s. Application should be made to Technical Publications Department, Philips Electrical Industries of New Zealand Ltd., P.O. Box 2097, Wellington.

In last month's instalment, we described in general terms the requirements of a simple amateur receiver, and the features that we had decided to include in this particular one. This month we feature the complete circuit, together with photographs of the receiver as built in our laboratory.

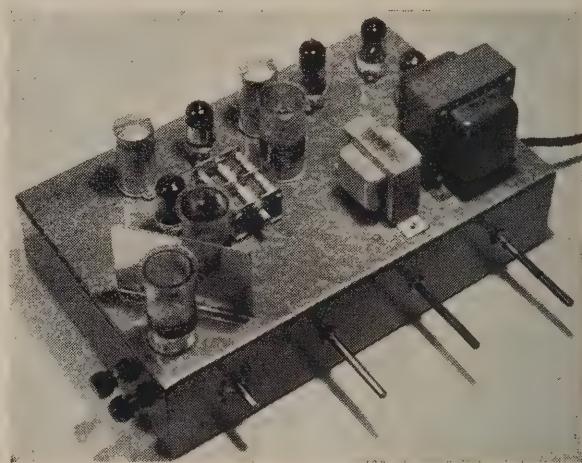
THE CIRCUIT

Five valves are used in all. An ECH42 is the oscillator-mixer, an EAF42 is the I.F. amplifier and A.V.C. rectifier, and one section of an ECC40 is the second detector. The other section of this valve is an audio amplifier stage, which feeds an EL42 as the output stage. The power rectifier is another Rimlock valve, an EZ40. The line-up is almost exactly that of a conventional five-valve broadcast receiver, and yet, by indulging in a very few circuit dodges, the set becomes a very creditable performer as a communications receiver.

The audio section is conventional, and requires no special comment. The volume control precedes the first audio stage, and so is effective when the headphones are in use. The closed-circuit phone jack removes the signal voltage from the grid of the output tube, silencing the speaker when the phones are in use. No attempt has been made to disconnect the H.T. to the output stage, as this would cause an increase in the H.T. voltage on the remaining valves, through reducing the load on the power supply.

I.F. regeneration has been used as a means of obtaining extra amplification without using any more valves, and for obtaining increased selectivity with the minimum of trouble. By advancing the regeneration control to the point where the second detector oscillates, the latter acts also as a B.F.O., saving yet another valve, and automatically obtaining increased selectivity for C.W. reception. This type of regeneration control is very smooth in action, and has the great advantage of not requiring any modification to the last I.F. transformer. The cathode coil L_6 is wound on a midget Ferroxcube pot-type core, which gives the required inductance with only 25 turns, and which has the further advantage of having no external field, which might otherwise affect the earlier I.F. circuits and cause instability.

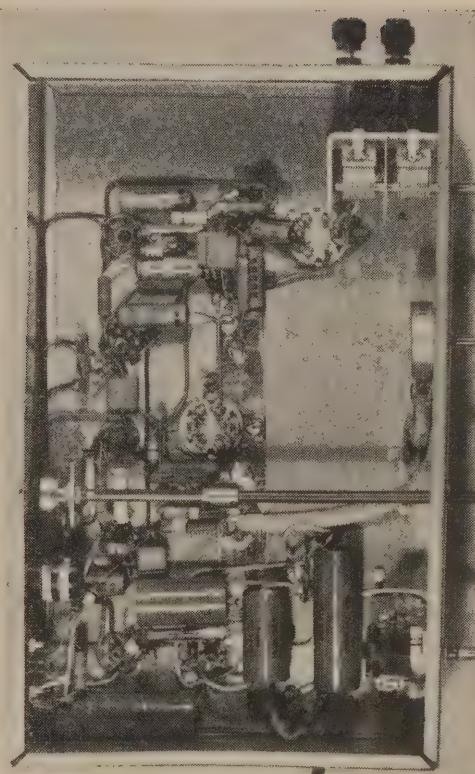
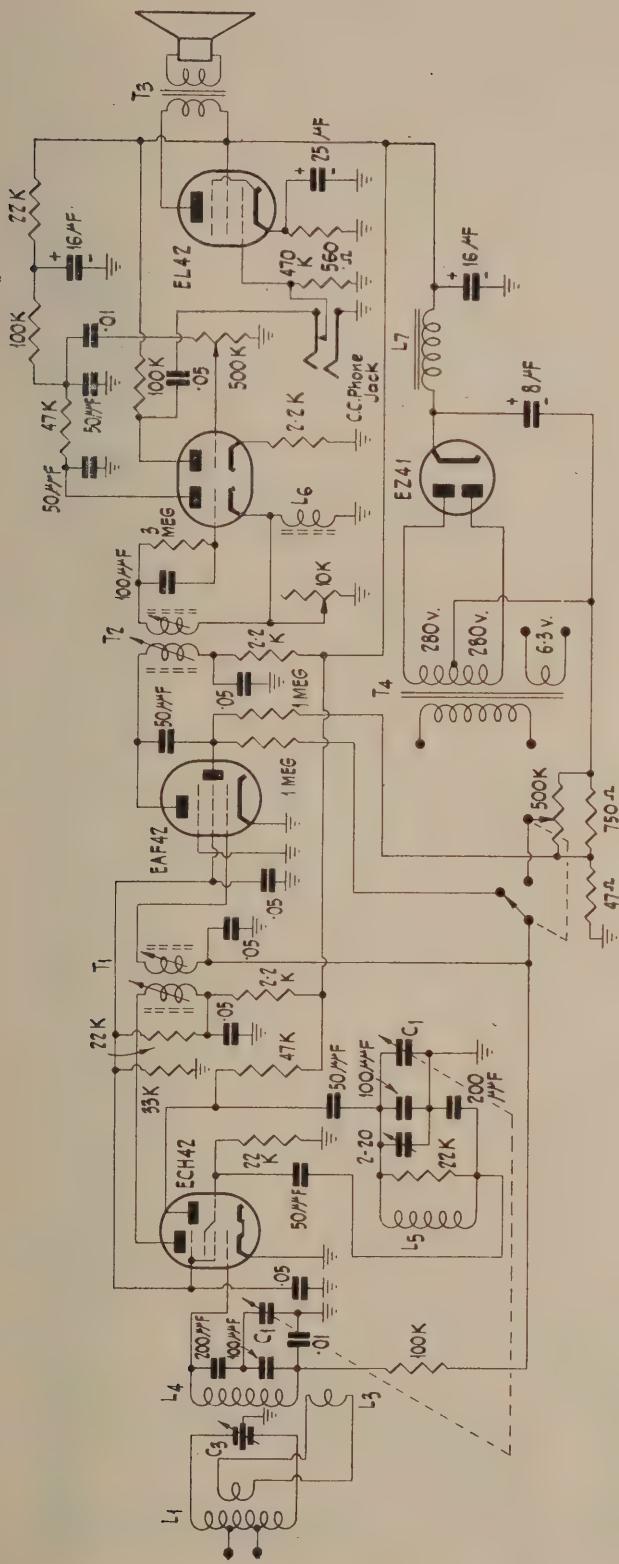
As the simplest means of obtaining optional manual or automatic gain control, and also to effect a certain saving in small parts, the receiver uses back bias, except for the audio and output stages. The A.V.C. on/off switch transfers the bias line for the ECH42 and EAF42 from the output of the A.V.C. diode to the moving arm of a 500k. potentiometer in parallel with the main back bias resistor of 750 ohms. The 47-ohm resistor at the lower end of the bias chain provides a minimum bias of -2 volts whether the



General view of the receiver. The left-hand knob is the aerial tuning, the next audio volume, after which come the regeneration control and the manual gain control, in which is incorporated the A.V.C. on/off switch. The main dial has been left off for clarity.

switch is in "manual" or "A.V.C." positions. The load resistor of the A.V.C. rectifier is returned to the -2-volt tap on the bias chain, so that this is effective as a minimum bias whatever the position of the switch.

Perhaps the most interesting part of the circuit is the R.F. end, which has one or two features not usually found in simple receivers. First of all, there is the built-in aerial tuning unit, or pre-selector, comprising L_1 , L_2 , and C_8 . This is a balanced tuned circuit, specially arranged for those who use a transmitting aerial with open-wire feeders. The L/C ratio has been chosen on the assumption that the receiver will be used with 600-ohm feeders; even with this degree-of-loading the circuit will provide a Q of approximately 40, and so will give a worth-while increase in input selectivity. The latter helps to compensate for the fact that there is no R.F. amplifier, and helps considerably in reducing image interference. The aerial tuner is coupled to the mixer grid coil by means of a short link, which has been given enough turns to ensure adequate coupling between the two tuned circuits without allowing them to be over-coupled. No attempt has been made to gang C_8 with the tuning dial of the receiver. In any case this would be an almost impos-



Underneath view of the set. The control with the long extension shaft is the regeneration control, which is mounted as close as possible to the detector valve. Note the shielded leads to the audio volume control.

C₁, C₁, 100 μuf . midget gang condenser. (Polar.)
C₃, midget broadcast two-gang condenser. (Polar.)
L₆, 25 turns of 36-gauge enamelled wire on a midget
Ferroxcube pot. core.

L₇, 60 ma. smoothing choke

sible job, and it is quite unnecessary, as C₈ does not need to be continually adjusted as one goes from one end of the band to the other. It can be peaked up after a signal has been chosen and properly tuned in with the main dial.

The oscillator and mixer input circuits, however, are ganged. The tuning range is so small that it is quite unnecessary to use a padding condenser in the oscillator circuit, proper padding being obtained by adjustment of the inductance of the oscillator coil by spreading or squeezing the turns a little.

Bandspreading is done by the shunt-series method, and the values of the various fixed condensers fortunately come out to easily obtainable values. Each section of the gang condenser has $100 \mu\text{f}$. in parallel with it, and the pair have $200 \mu\text{f}$. in series with them. In the grid circuit of the mixer, one end of the tuning coil is grounded through a $0.01 \mu\text{f}$. bypass condenser, to allow the A.V.C. bias to be fed through the coil. In the oscillator, exactly the same arrangement of condensers has been used. The only difference is that here, the tuned circuit is earthed not at one end, but

at the junction of the 200 μuf . series condenser with the other pair in parallel. Thus, both ends of the oscillator coil are "hot," or above ground for signal voltages, and this enables us to use a Colpitts oscillator circuit. This has a number of advantages. First, no tickler is needed. Secondly, the valve capacities connected across the oscillator coil are very much the same as those connected across the mixer grid coil, so that tracking of the two circuits is made easier. A third advantage is the extreme liveliness of this type of oscillator circuit. Indeed, so lively was it found, that a resistor of 22k had to be connected across the coil in order to reduce the grid current to the value required by the ECH42 for proper oscillator injection voltage. Reducing the oscillator amplitude in this way has the advantage that at the higher frequencies, where the amplitude of any oscillator tends to fall off, full advantage can be taken of the excellent performance of the Colpitts circuit, simply by omitting the shunt resistor. So that it would be effective only on the one frequency range, the resistor was built into the coil itself rather than wiring it into the set. The same remark applies to the band-spreading condensers. These are all mounted inside the coil formers, as we shall see later.

COIL DATA

At this stage we are giving the coil data for the 80-metre band only, since the beginner will be starting on this band. All coils were wound on $1\frac{1}{4}$ in. diameter polystyrene formers with six-pin plug-in bases. In all cases, 30-gauge enamelled wire was used, and the windings were double-spaced. Numbers of turns were as follows:—

N.Z.A.R.T. NOTES

Supplied by the Publicity Committee, N.Z.A.R.T., 25 Lees Road, Christchurch, to whom all correspondence relating thereto should be addressed.

The results of the Memorial Contest were as follows:—

High Power Open Section, Memorial Trophy: 1st, ZL1AJU, B. F. Barnard, Pukekohe; 2nd, ZL1AIX, W. J. Robinson, Auckland; 3rd, ZL3LL, J. N. McKim, Christchurch.

High Power CW Section, Auckland Short Wave Cup: 1st, ZL1AH, J. D. Wightman, Auckland; 2nd, ZL3LL, J. N. McKim, Christchurch; 3rd, ZL1IB, E. E. Brown, Te Puke.

Lower Power Section, Mannell Trophy: 1st, ZL2AJO, C. E. Shaw, New Plymouth; 2nd, ZL2ASV, R. Lynneberg, Wellington; 3rd, ZL1AJD, F. J. Krippner, Te Awamutu.

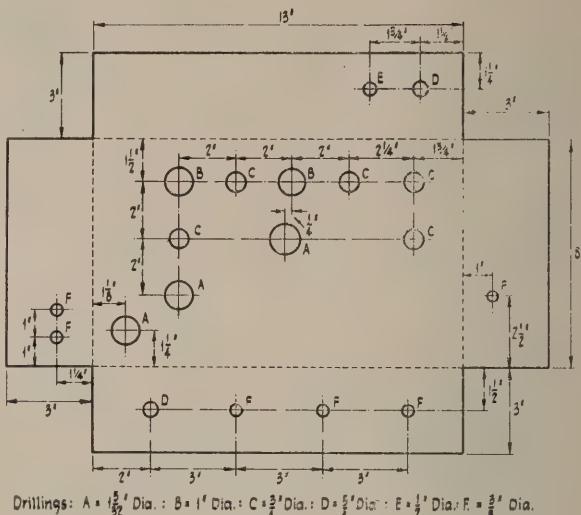
The entries in the CW section were poor, and rather support the contention that CW as a form of communication is fast dying out of the Amateur's activities. This tendency on the part of newer Hams to neglect CW has increased greatly over the past few years, much to the regret of the "Old Timers," who feel that more attention should be paid to telegraphy as a form of communication.

The Laing Smith Trophy, awarded to the highest scorer who has been licensed for under twelve months, was won by ZL1AMO, R. W. Wright of Auckland. Once more, the successful placings were dependent on the odd piece of DX available. The summaries of all stations show that ZL1AJU worked all the DX available. A fine effort.

History was made when the first station to operate from the Tokelau Group was heard on the air recently. Barry, VR2BZ caused quite a pile up with his "portable ZM7." To the many who missed him we suggest you keep listening, as the DX grapevine tells us there may be another station in this area soon.

Recently a hidden transmitter hunt was held in Dunedin, resulting in a close finish between ZL4KG and ZL4FD, who were not put off by the large "Keep Out" notice in the offing. As far as we know, this is the first such hunt to be held in New Zealand since the War. It provides much food for thought, and should be kept in mind when planning the activities for the conference to be held in Christchurch next year.

Fresh from overseas travels, Ron Coakley, ZL2RC, is now



L₁, 17 turns, tapped at 7 turns from each end.
L₂, 4 turns, wound over the centre turns of L₁.
L₃, 5 turns, spaced $\frac{1}{4}$ in. from the cold end of L₄.
L₄, 26 turns.
L₅, 22 turns.

searching for a suitable spot in which to retire. The two main requirements are a good climate and a good DX response.

From Tom Rowlands, ZL3JX, we hope to hear more about his pet project, VHR bands, when he has had time to settle down again after his recent trip to the United Kingdom.

"Centre Tap," writing in the October, 1953, issue of "The Radio Constructor," discusses amateur radio in Austria.

After pointing out that amateur transmitting in Austria is illegal, and that, in consequence, all "Ham" activity is "underground," he continues:

"It has all the romance of a secret society and a friendliness and camaraderie that is really heart-warming. You simply find one amateur and he links you up with the man from whom he gets his QSL cards. He, in turn, puts you in touch with "sub-managers" of whatever districts you intend visiting. Thus, you find yourself looking for George, except that George is not his real name, but simply his radio name. His real name is Anton. He, in turn, introduces you to Ed. Ed's proper name is Josef, and so on. A bit perplexing at first, but I soon got used to it. Once, however, the system slipped badly. It was when I was to meet John, whose proper name was "Schoss." The buccaneering pseudonyms are fun until, as on this occasion, one cannot make sense of them in English or in German. I repeated the name two or three times to make sure I had got it right. Yes, there was no doubt about it, Schoss was the name—"the name of your King."

This was before the Coronation, but we still didn't have a King, and none likely, at least by the name of Schoss. Even the name of the Prince Consort-to-be, Philip, could not by any stretch of imagination be turned into Schoss.

It took me quite a time to discover they meant Charles—referring either to a former King, or mistakenly to the present "Prince Schoss."

When there's a better switch

ARCOLECTRIC will make it

New Zealand Agents
GREEN & COOPER LTD. WELLINGTON.

Colour Television

At a recent meeting of the Radio Industries Club held in London, Mr. C. O. Stanley, C.B.E., Chairman of Directors of Pye Ltd., Cambridge, England, passed some interesting comments on colour television. As these are of no little importance, we reproduce hereunder extracts from his speech, which we think will be of considerable interest to our readers.

"The only country in the world committed to a colour transmission system is the United States, and it is interesting therefore to look back over the events that have taken place in that country. For a long time the merits of every system were debated and weighed up against each other, until finally the Federal Communications Commission (F.C.C.) accepted the C.B.S. system of colour television transmission, which was sequential and noncompatible. The whole industry in America quickly realized that there were great difficulties in this system and a co-operative movement was started among manufacturers to evolve the standards and specifications for a compatible colour system. It is interesting to see an industry getting together to try and solve its own difficulties, and it is a lesson we might well learn in this country.

Compatible colour, in my opinion, was thought up in the United States as a political manoeuvre. The argument usually given for its desirability is that there would never be sufficient wavelengths in Bands I, II, and III to satisfy the demand for black-and-white stations, and, consequently, Bands IV and V also had to be largely allocated basically for black and white transmissions.

Another argument raised was the question of revenue. Broadcasting business in the United States is dependent on advertising revenue, and to carry an expensive project such as colour television, it was absolutely essential to start off with a substantial viewing public. This public could only be found from the ranks of the viewers of black and white transmissions—hence they must be able to receive a picture from the colour transmission.

Again compatibility may well have been conceived by the possibility of establishing a strong patent position.

The net result in America is that a compatible system has been devised; a most ingenious and complicated system which has increased the cost of the receiver many times over that of the present black and white receiver. In addition, the successful operation of the system depends on the economic production of a colour tube in the right sizes. Up to the moment the tube that has been produced gives a picture the dimensions of which are 8½ inches by 11½ inches. Can one possibly imagine a nation that has been used to a twenty-one inch picture being satisfied with this size? Even in this country I believe that the size of our bulk market black and white picture will gradually increase above the present popular size of seventeen inches.

The injudicious launching of a colour project in the United States threw the whole TV industry in that country into chaos, and although the system was announced nine months ago, it is unlikely that there will be more than fifty thousand colour television sets produced in America during this season.

Many years ago when Britain started the world's first television system, it was decided (which at that time was most advanced thinking but unfortunately later proved to be wrong) to adopt a low line standard for television of 405 lines. With the knowledge that was available at that time, this standard was a great advance on the standards used up to that moment, but since then it has proved to be a great embarrassment to our industry, particularly in the export field.

Now that Colour has become the obvious next step in the development of television, let us learn from our past mistakes and not again hitch ourselves to a wrong system. In 1946, when there were only about 7,000 licensed television sets, we had another opportunity to make the brave decision to adopt the 525 line international standard even though it would have delayed the resumption of television broadcasts for anything up to two years and have rendered the existing sets obsolete, but at that time it was not easy for either the B.B.C. or the manufacturers to appreciate the advantages of retarding the progress of the whole television industry. Let us make our own mistakes if we must, but not a mistake just because the Americans have already made it. I am convinced that we now have a marvellous opportunity to forge ahead in television by adopting a colour standard which may well be in advance of that used in the United States.

We must ask ourselves if it is not a fact that it is impossible to fit in satisfactorily any form of colour system in the channels available in Band III. We must also ask ourselves if it is not a fact that a compatible system in Band III will give us an inferior black and white programme from a colour transmission, that is, inferior to the black and white picture

from a black and white transmission. And if this is so, will the public continue to look at it? We must be very careful before we come to any conclusions that we weigh up the advantages and disadvantages of compatible versus non-compatible systems, always bearing in mind that sets must be made economically to come within the purchasing power of the public. We must examine in the greatest detail Bands IV and V and see if it is not true that we could produce a colour picture of much better quality than anything that has been shown up to date. Also we must investigate the possibilities of sending out a separate black and white transmission on the same colour signal from the studio, and decide whether the eventual cost to the consumer would or would not be far less than that involved in the use of a compatible system, without the disadvantage of a very inferior picture.

Looking at all this objectively, I am convinced there is no half-way house in the matter. The system we start with is the system we shall end with, and in my opinion it rules out any public experiment of a compatible or semicompatible system in Band III, with the hope that later we will be able to move colour television to Bands IV and V. Once we start with something we shall continue with it. The spending of public money must always be justified and we shall be told it is too expensive to make a change. If it takes a little longer to investigate not only what has been done by the Americans but the full implications of a non-compatible system in Bands IV and V, we should carry out that investigation. It should always be our aim to regain the lead in the television industry, and if we happen to be right in going into something quite new, it would have an enormous effect on our export market.

I have heard many people talk about the possibility of having colour television in this country in two years' time. You might have colour television in two years' time, but of a kind and type which, in my opinion, will be no credit to anybody, and which will probably cause chaos in the employment and prosperity of the industry. Nearly a year ago the Americans started a compatible system and they will be very fortunate next winter if they make fifty thousand sets—and remember the American market is one of twenty-nine million existing television receivers. Dr. Baker of the General Electric Company of America recently said that it was only by heroic engineering effort that the economic tube for compatible television would be ready by May, 1955, and yet people here are talking of two years for a colour system in England. It is my opinion on the evidence before me that given the choice today of the American colour system or no system at all in two years' time, it had much better be none. If we are to have colour TV as good as the British black and white there is not the slightest chance of getting it within two years, and if we set out to get it we will run the risk of damaging the entertainment of millions of people, and this is not worthwhile—even if it did create a new patent situation.

As a member of the Television Advisory Committee, I am asked not to express publicly any opinions on matters that are before that body for consideration, and therefore I can only issue a warning to this industry that the very closest examination should be made by the industry itself before any conclusions are reached. I am aware of the great value of Royal Commissions and Government-sponsored committees on our great national problems, but I firmly believe that this industry, as a whole, could and should provide the answer to the colour TV question, and not wait for any committee, Government or otherwise, to produce a recommendation.

RADIO SERVICING

Correspondence Course specially compiled to meet New Zealand Examination Syllabus. Free prospectus.

NEW ZEALAND RADIO COLLEGE
26 HELLABY'S BUILDING . . . AUCKLAND, C.1

THE KLYSTRON

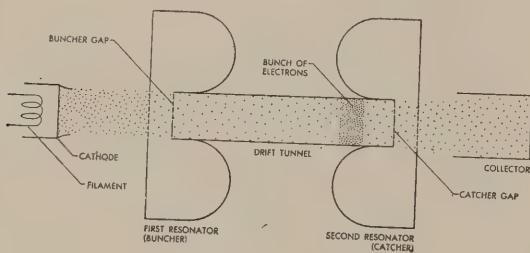
Long overshadowed by the famous magnetron, this ingenious radio tube has now come into its own as a broadly useful means of generating, receiving and amplifying microwaves.

By Edward L. Ginzton

(Reproduced with acknowledgement to "Scientific American" March, 1954).

Just before World War II there was a brief blaze of publicity about a new vacuum tube called the klystron. The klystron was celebrated as an invention that would open up a whole new region of radio frequencies and make possible the development of radar. It lived up to its promise, and it played a very important role in the war. But it was overshadowed by another new tube, the magnetron, and the klystron faded from public attention.

It may surprise many people, though it will certainly not surprise radio engineers or physicists, to hear that the klystron not only is still around but is flourishing more brilliantly than ever. From radar, in which it still plays its important role, it has branched out to other uses in the military field, in television, in telephony, in navigation and in physics research—with the promise of more services to come in the

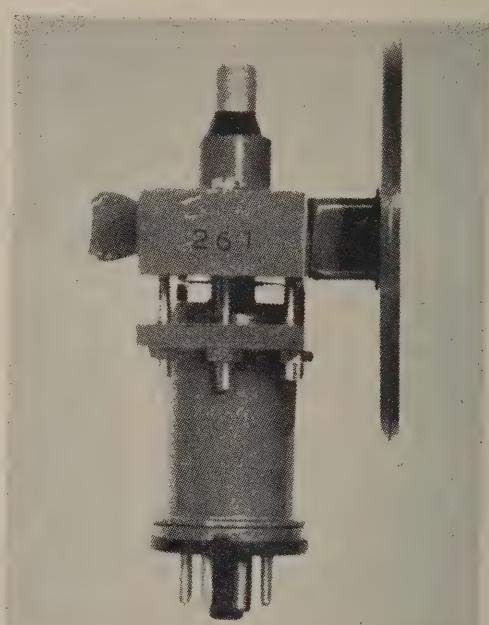


Principle of the klystron is outlined in this diagram of a tube with two resonators. Electrons are produced by the cathode at the left accelerated toward the collector at the right. As they pass through the oscillating electric field of the resonator, some of the electrons are speeded up and others slowed down. Then, as the electrons proceed down the drift tube, the faster ones catch up with the slower, forming a bunch. When the bunch passes the second resonator, an oscillation is excited in it.

future. Since the end of the war the klystron has been developed to powers undreamed of when it was first conceived.

The klystron works in the domain of microwaves. In that region it performs the same functions that ordinary electronic vacuum tubes do at conventional radio frequencies; that is, it can generate, receive and amplify radio signals or energy. The klystron was invented because the ordinary triode tube cannot handle microwaves effectively. Let us look at the reasons it cannot—at the problem which the klystron solved so beautifully.

A triode radio tube, as almost everyone knows, consists of three elements; a filament that emits



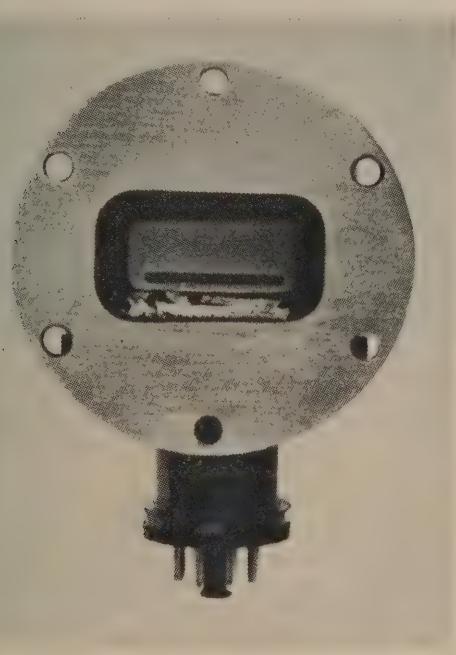
One-watt klystron made by Varian Associates is shown from two sides. It is a reflex tube which generates microwaves five centimeters long. The oblong opening in photograph at right is coupled to a wave guide, the pipe used to conduct microwaves.

a stream of electrons, a grid that stands in the path of the stream, and a plate that attracts the electrons and catches them after they pass through the grid. The grid acts like a valve, opening or closing to the passage of electrons according to the voltage on it. Radio waves intercepted by an antenna come to the grid as a weak alternating current oscillating with the radio waves' frequency. The oscillating voltage thus applied to the grid modulates the flow of the electrons crossing the tube to the same frequency. The electron stream then delivers at the catching plate an alternating current which reproduces with great amplification the weak signal on the grid.

Now the time it takes an electron to cross the tube is something of the order of a billionth of a second. This transit time is short compared to a cycle of a long radio wave (around a millionth of a second); hence the electron is slowed or speeded by the voltage on the grid at one moment of the cycle. The flow of electrons therefore can follow the voltage

fluctuations. In the case of microwaves, however, the oscillations are so rapid (i.e., the cycle is so short) that the voltage on the grid may go through several complete oscillations during an electron's travel across the tube. In other words, the grid voltage changes too fast and produces only chaos among the electrons. It no longer can impose the signal pattern on their flow.

There are other reasons why the conventional triode tube fails in the microwave range, but this is the most fundamental one. Several new types of tube have been invented to overcome the difficulty—the magnetron, the "close-spaced" triode, the travel-

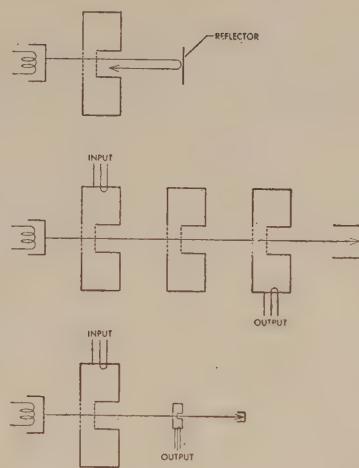


ling-wave tube. With the possible exception of the travelling-wave tube, none of these is quite as simple or versatile as the klystron.

The klystron tube makes a virtue of the very thing that defeats the triode—the transit time of the electrons. What it does is to "modulate" the velocity of electrons so that as they travel through the tube they sort themselves into groups and arrive at their destination in bunches, thus delivering an oscillating current of controlled frequency.

To take the klystron in its simplest form, picture a long vacuum tube consisting of several sections, of which the most important are two chambers enclosed in metallic shells [see illustration]. At one end a cathode, as in any electronic tube, feeds a stream of electrons into the tube. The electrons are pulled toward the opposite end by a positively charged plate and are focused into a beam by a magnetic field applied from outside.

When the electrons pass through the first chamber, crossing what is called the "buncher gap," they encounter an oscillating electric field analogous to the oscillating voltage on the grid in a triode tube. This metal-enclosed chamber, known as a cavity resonator,



Variations use resonators in different ways. In the reflex klystron (top) the electrons pass through a single resonator twice. In the cascade amplifier (middle) the electrons pass through three or more resonators. In the frequency multiplier (bottom) the second resonator is tuned not to the frequency of arriving bunches but to a multiple of it.

is the crux of the device. The electric field within the cavity is produced by the microwave signal to be amplified. When the cavity is a certain size, it will resonate to microwaves of a certain frequency, which thereby set up an oscillating electric field within the enclosure. The cavity can be tuned to various microwave frequencies simply by adjusting its size by some mechanical means. A crude analogy to the cavity resonator would be a glass goblet which resonates at a certain pitch depending on the level of the water in it—that is, the size of the air cavity.

The oscillating field alternately gives the ends of the gap a negative and positive charge. As a result some of the electrons are slowed down as they pass across the gap and others are speeded up. In the next stage of their journey, through a so-called "drift tunnel," the faster electrons catch up with the slower ones and bunches are formed. Just when the bunching has become sharpest, the electron groups reach the second gap, also a cavity resonator. If this cavity is tuned to the frequency of their arrival, the electron bunches will excite electrical oscillations in it, just as hitting a pendulum with periodic strokes timed to its natural frequency will keep it swinging. The electrical energy delivered at this "catcher gap" is taken off by some suitable transmission line. After the electrons have passed beyond the gap, they are caught in a collector bucket and their remaining kinetic energy is spent in the form of heat.

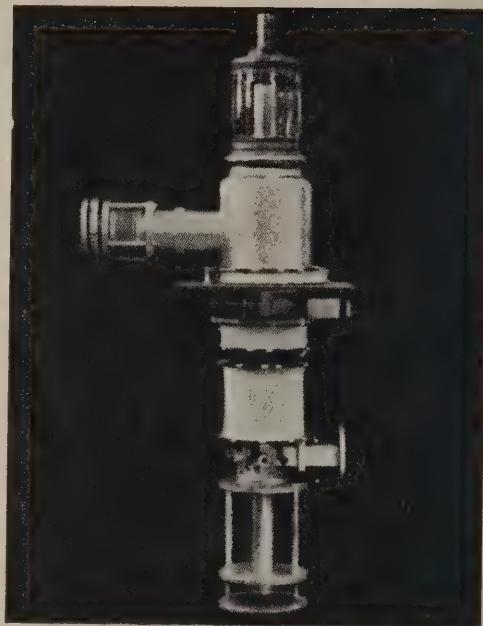
This simple klystron tube, like a conventional triode tube, acts as an amplifier: it uses a weak microwave signal to convert the power of the electron beam into microwave power. The same tube can be employed to generate microwaves, feeding part of the power from the second cavity back to the first. Many other variations of the klystron are possible. For instance, it can be made with only one cavity resonator, which serves both as the buncher and the catcher.

[see diagram]. After the electrons have crossed the cavity, they are reflected back into it by a negatively charged plate; on their return they arrive in bunches and boost the power of the electrical oscillations in the resonant circuit. This reflex klystron, as it is called, is very handy because there is only one cavity to tune, and it was used by the millions in radar sets during the war. Another version of the klystron has three or more cavities in series; this improves the bunching of the electrons and enhances the efficiency of the tube. Still another variation is the so-called "frequency-multiplier" klystron. The catcher gap is made resonant not to the frequency of the arrival of bunches but to some whole multiple of that frequency—as if a pendulum were pushed not at every swing but at every second, third, fourth or even 20th swing. The tube then puts out a higher frequency than is fed into it. This klystron is especially valuable in applications where it is important to hold a transmitter to a given frequency with great precision.

The simplicity of the klystron, both in principle and in practice, is its most attractive feature. It contains no wires to dissipate and lose electrical energy. Its three basic functions—formation of an electron beam, generation of microwave power and disposal of the heat of the spent electrons—are physically separated and nearly independent of one another. This makes it easy to design new variations of the tube and to understand their operation. And the klystron's efficiency in converting electrical energy into microwave power is comparatively high—usually between 25 and 40 per cent. and sometimes as high as 50 per cent. In its early years the klystron was not believed capable of putting out much power, and it was used mainly as a receiver tube, with the magnetron taking over transmitting jobs. But its development since the war has dispelled that idea; today there are klystrons which generate much more power than has ever been achieved with a magnetron or any other radio tube. A klystron developed at Stanford University for use in linear accelerators can put out, in short pulses, a peak power of 30 million watts—a level that approaches the power consumption of a small city.

The klystron is now 15 years old. The principle of the velocity modulation and bunching of electrons was conceived independently by A. Heil and O. Heil in Germany in 1935 and by W. C. Hahn and G. F. Metcalf and the Varian brothers, Russell and Sigurd, in the U.S. in 1939. Meanwhile W. W. Hansen of Stanford University, who was seeking ways to accelerate electrons to higher energies, discovered the principle of the cavity resonator. The first klystron was built in 1938 by the Varian brothers, Hansen and other collaborators at Stanford. During the war the U.S., England and France independently produced klystrons which were nearly identical in appearance and performance. This is not surprising, for the fundamental principles are simple and the original papers on them were sufficiently clear to point the way to development of various klystron devices.

After the war many of the laboratories that had been working in the klystron field dropped this effort; only two or three in the U.S. and a similar number in England and France continued research. At Stanford the Hansen-Varian group reassembled to develop the klystron further, and one of their



Thirty-million-watt klystron made at Stanford University. Its output is used to propel electrons in the new Stanford linear accelerator. Standing about three feet high, it is the most powerful radio tube ever made.

interests was to use it to generate unprecedented amounts of microwave power for accelerators in nuclear physics. The tube they devised for the Stanford linear electron accelerator is the most powerful vacuum tube ever made. It operates at a wavelength of 10 centimeters. The klystron can put out its great power of 30 million watts only in pulses, for the equipment would quickly overheat if the output were continuous. Altogether the klystrons in Stanford's billion-volt accelerator will provide about 400 million watts of power.

The high-power klystron has been turned to many other uses, and several manufacturers now produce it commercially. It is believed to have promising possibilities in moderate-sized electron accelerators for treating cancer, sterilizing food and drugs, de-infesting grain and fruit and so on.

In radar sets the klystron is still giving wide and rugged service. Reflex klystrons as small as one or two inches in length have been made for aircraft sets. Larger ones are serving as transmitters in microwave relay systems, not only for television but also for other communications. One tube of this kind can generate as much as 10 watts of power. In the new ultrahigh-frequency television broadcasting region klystron will be invaluable. One large klystron especially designed for transmitting service in that band is nearly as tall as a man. It is a three-cavity amplifier, capable of delivering more than 15 kilowatts of power continuously. A high-power klystron must be large so that it can dissipate the heat pro-

(Continued on page 46).

N.Z. RADIO-TELEVISION AND ELECTRICAL TRADERS' ASSN. (Inc.)

At the annual general meeting of the N.Z. Radio-Television and Electrical Traders' Association (Inc.) held in Auckland on 9th August last, the election of officers resulted as follows: President, Mr. C. R. Peoples; Vice-president, Mr. W. Murphy; Executive, Messrs. H. J. Barr, T. Bartlett, W. Knox, R. R. Stephen, J. Walsh, H. Wilson, G. M. Vicary, R. Oxenham, D. G. Black, E. Larcombe, M. C. L. Rhodes, M. H. Swinburne, D. Staff, J. K. Brackenridge and A. C. Boulton.

Dates for the Annual Conference to take place at Cambridge were fixed for 11th and 12th September. In addition to a comprehensive official agenda providing for discussion of all matters affecting radio and electrical dealers in the area, a bright social programme has been planned by the Waikato Group, and this opportunity to get together formally and informally to discuss common problems should be enjoyed by all.

Commenting on the unspectacular though considerable achievements of the organisation during the past twelve months, the President, Mr. C. R. Peoples, considered the results of these to be strengthening the foundations of the industry and promoting wider harmony among members of the trade.

Membership now stands at 134 and the increased interest displayed has enabled the Association to extend its activities for the benefit of the industry and members alike.

The new regulations concerning the registration of radio servicemen has occasioned much concern, continued Mr. Peoples, and it was felt that some compromise should be made in the cases of those highly skilled and competent technicians who cannot procure registration on these qualifications alone but are required to sit for the Radio Servicemen's Examination. In the meantime, in spite of the Association's endeavours, it seems that nothing further can be done, but the matter is still being pursued.

The matter of the proportions of apprentices is also being closely watched.

Though complete success has not crowned the Association's efforts with regard to the contentious question of fair trading, some ground has been gained.

An up-to-date list of bona fide radio dealers has been maintained, and the eligibility of certain firms to appear thereon was explained by the fact that they are industrial consumers. That is, they employ qualified technicians to build and service electronic devices. Thus they are entitled to discounts when purchasing radio component parts.

Mr. Peoples expressed his pleasure in the interest shown by members of Country Groups and thanked Mr. Brackenridge

for his efforts in arranging meetings, etc. The stimulating ideas produced by these Groups have been greatly appreciated by the Association and circulated throughout the trade in that area.

Of the 32 students who sat the first examinations of the TV Course being held at the Seddon Memorial Technical College, 30 were successful. Later in the year it is hoped to conduct correspondence classes. At present, with the assistance of technicians from the industry, Mr. Wardell who is conducting the TV course, is building a 50-watt transmitter, and it is hoped that transmission will commence early in the new year. The generosity of certain firms in making handsome gifts of equipment or assisting in the manufacture of essential components has been greatly appreciated by the College, and congratulations were extended to the technicians who by their combined efforts have done so much to hasten the advent of TV in this country.

In his annual report, Mr. Peoples expressed his appreciation of the co-operation of the N.Z. Radio Traders' Federation, and reported on the Annual Conference of that body.

In spite of strenuous efforts, a universal guarantee of 90 days has not been achieved as yet.

When discussing mark-ups on radios, Mr. Peoples admitted that, in the lower-price bracket, taking into consideration after-sales service, in some cases the dealer is not getting sufficient profit. However, he drew attention to the fact that, from the point of view of unit mark-up, irrespective of retail price, the latter is normally uniform. Naturally, however, the lower the retail price, the lower the actual amount of profit expressed in pounds, shillings, and pence, though the percentage mark-up remains the same.

With the co-operation of Country Groups, the Auckland Association has now embarked on an extensive sales drive on car radios from which promising results are expected.

Difficulties still existing with regard to the supply of various components have been resolved in a number of cases by the Association making the strongest representations to the appropriate authorities, thereby assisting manufacturers and dealers to procure the necessary import licences.

Concluding his report, Mr. Peoples thanked all members of the Executive for their loyal co-operation, and all members of the Association for their interest and co-operative spirit. Extending good wishes to all members of the industry, Mr. Peoples hoped that the forthcoming year would prove as buoyant as the preceding twelve months.

News from Government Departments

SCIENTIFIC AND INDUSTRIAL RESEARCH:

Medical Instrumentation

Sections of the Auckland Industrial Development Laboratories, Department of Scientific and Industrial Research, work in co-operation with the medical profession in medical and surgical instrumentation, including the development of special electronic equipment for measurement and control purposes.

At present the staff are advising on the design, materials and equipment for a sound-proof room at the Schools for the Deaf at Titirangi and Kelston. One of the important functions of these schools is to evaluate incipient or partial deafness in the young child, so that remedial measures or special tuition can be provided. It is desirable, therefore, that the audiometric equipment for this testing be installed in a sound-proof room so that background noise does not affect the evaluation.

POST OFFICE NEWSBRIEFS:

Mobile Radio-telephone Service

The Post Office mobile radio-telephone service established in larger centres to serve the needs of public and private utility concerns, now comprises 54 channels in nineteen of the larger centres, providing service for 1715 vehicles. In 88 smaller towns there are 106 such private services licensed, serving 296 mobile units.

Ship-Shore Communication

The number of ships licensed to use radio equipment for communication with shore stations or with each other is now 876. In addition, there are 65 New Zealand civil aircraft carrying radio installations.

Frequency Bands for Amateur Radio Stations

Effective from 1st September, 1953, the frequency band 3,500-3,960 kilocycles used for amateur radio stations was reduced to 3,500-3,900 kilocycles. From 1st October the band 1,900-1,925 kilocycles was replaced by 1,875-1,900 kilocycles. These changes were made to conform with International and Regional Radio Frequency Re-allocations Agreements.

There are now 2,336 licensed amateur radio stations in New Zealand, compared with 2,294 a year ago.

New dialling systems on toll circuits

New direct dialling systems, which enable toll operators to dial direct to subscribers at a distant exchange, are now in operation between most main centres. The introduction of this system has effected a saving in switching facilities, and operators' time, and has proved a big factor in keeping to a minimum delays on traffic over the busier toll routes.

Co-ordination of Governmental Telecommunication Needs

The post Office undertakes the function of co-ordinating governmental telecommunication needs. It is assisted in this work by an Inter-departmental Committee called the Civil Communication Committee, which was set up in 1947. On it are representatives of the various departments concerned with the use of telecommunication services. The Armed Services are also represented on this committee.

Big Business Ahead for Post Office

1,000,000 telephones, 75,000,000 toll calls a year, and big use by business of direct Office-to-office teleprinter and facsimile services are forecasts for 25 years hence given in the annual report of the Post Office.

RECORD TALK

By JOHN GRAY

"Three coins in the fountain" is a tune you find yourself humming or whistling unconsciously, which is one of the surest tests of "hit parade" potentialities. Of current versions, that on Capitol CP 328 would appear to lead the field, since it is sung by the redoubtable and reliable Frank Sinatra, and his is the "anonymous" voice heard singing it during the atmospheric opening sequence of the current cinemascopic film.

Philips continue to make a decided impression with their popular releases. Their version of the "Happy Wanderer" by the Beverley Sisters (P28513) merits attention. People who feel we have had a surfeit of "sister acts" on records will be agreeably surprised by this talented pair. For those—and there are very many—whose tastes lie somewhere on the borderline between popular and classical, there is a delightful Percy Faith record (B21226) in which two superior tunes, "The River," and "Edelma" are given decidedly superior treatment, and in the course of which Mitch Miller manages solo contributions on both oboe and English horn! Johnnie Ray fans will certainly not want to miss "Such a Night" (B21234). Nobody could really duplicate the style of this, though a gentleman on a certain other make of record has already attempted it.

Philips have been drawing special attention to their "Boy Scout" record (P26038). Made during a Scout pageant at the Royal Albert Hall, this features some attractive massed singing and ends with a new Scout taking the oath. It should find a ready sale in the appropriate quarters.

The phenomenal popularity of children's choirs will secure a warm welcome for H.M.V.'s version of the "Happy Wanderer." Released under their Parlophone label (A7858) it is sung by the Oberkirchen Children's Choir, who have recently had a pronounced success in England. Those who are readily amused by the King of Corn will need no extra recommendation to go out and buy H.M.V. EA 4718—"Dance of the Hours." Spike Jones does just what one would expect with this, Beedlebaum and all. Danny Kaye's "Knock on Wood" is on Columbia DO 70094. Its backing, "All About You," comes from the same film and both numbers are first rate specimens of Mr. Kaye's drollery.

On four Columbia records (DO 3464-9) you may hear some really caring vocalism from M. Rene Paul, who has just toured New Zealand with the "Call Me Madam" company. My impression on hearing these discs is that Mr. Paul is like "Ike"—very good in front of a mike, for he sounds more impressive here than ever he did in the theatre. These Australian recordings have been given fine orchestral backing and are well worth your attention. They are sung in a mixture of French and English. The evergreen "Parlez moi d'amour" is on DO 3646 and the haunting "Under the Bridges of Paris" on DO 3648. Don't be alarmed by sounds in the latter which suggest a cracked record—they are effects indicative of footsteps under the bridges.

Among other popular LPs made available by the H.M.V. group it is good to note the trumpet-voiced Ethel Merman's disc of "Songs she has made famous" (Brunswick LA 8636). It is impossible not to see, or rather hear, just why Miss Merman has long been America's First Lady of musical comedy. Some of Kreisler's best known tunes are given refreshing treatment by Reginald Kell, with orchestra under Camerata (LA 8632). On H.M.V. DLP 1024 will be found the original Glenn Miller recordings of the tunes which featured prominently in the recent film of his life. For those who really use dance records for dancing to, LP is surely an answer to prayer, and they will be interested in the latest such releases by the bands of Joe Loss (H.M.V. DLP 1027) and Victor Silvester (Col 33S 1015).

The flow of Festival Records shows no sign of abating. Unless I am mistaken, the stylish piano playing of Johnny Guarnieri has not previously been accessible to local buyers. He turns up now on CFR 10-113 (LP) with half a dozen intriguing titles including "Gloss Me Again" and "Hangover." For jazz fans with a curiosity as to how other nations do it, there is CFR 10-116 labelled "Jazz from Sweden." The Festival people have also managed to snare Burl Ives who sings eight "folk songs about the fair sex" on CFR 10-374, and in a different vein one may sample the dazzling trumpet playing of Rafael Mendez on CFR 10-370. Great names jostle one another on the Festival lists—Frankie Laine, Ethel Smith, David Rose, Charles Norman, George Shearing, Percy Faith—there is something here for everybody. There is even the admired Todd Duncan, whose records have never been over-plentiful, so there should be a warm welcome for his recital of Spirituals on CFR 12-156.

Someone must consider "Tosca" the world's favourite opera: no fewer than four LP versions are now available here. Ignoring for the moment the earlier Decca and H.M.V. offerings, we find this month that both Columbia and Festival (Westminster) are releasing this rich and powerful work.

At first sight the Westminster version (WAL 302) would appear at a disadvantage since it occupies three records while all the others manage with two. But there are one or two strong selling points regarding this Westminster version. The recording as such has been hailed everywhere as a technical triumph, especially as regards the orchestra, and the discs are available in a proper album (other and more venerable companies please note). As in the case of "Don Pasquale" under the same label, the performance was done in Vienna but the main principals are Italian. The Columbia recordings (33CX 1094-5) has, however, some equally strong points in its favour. It is the newest (not that that matters very much). It is a "La Scala" recording, made with the official sanction of that theatre, and is directed by one of the greatest conductors in the world, Victor de Sabata. By all accounts its Scarpia, Tito Gobbi, is the best yet to sing this role for a complete recording. And it boasts the superlative soprano-tenor combination of Maria Meneghini Callas and Giuseppe di Stefano, who have already starred with success in Columbia's "I Puritani" and "Lucia di Lammermoor" (with "Cavalleria Rusticana" in the offing). In short, this is the great "Tosca" on records to-day, though before committing yourself you may care to reflect that the Decca set has Renata Tebaldi in wonderful form and that the H.M.V. has the one and only Beniamino Gigli.

Westminster have come up with a clever idea—the collection of Beethoven's four overtures to "Fidelio" (three of them named "Leonora," of course) on to one disc (WL 5177). This will be very interesting to students of Beethoven's style and development, and as for more ordinary folk, there is of course no need to play all four at one sitting. Westminster's "house" conductor, Hermann Scherchen, leads the Vienna State Opera Orchestra on this disc and also turns on a forceful rendering of the same composer's seventh symphony (WL 5089). Chamber music devotees should note that WL 5027 contains the first release ever, in this part of the world, of a rare heard string quintet by Brahms, the F major, opus 88 (Vienna Konzerthaus Quartet with an additional viola).

The H.M.V. group of companies have once again launched a formidable pile of LPs. At the head of the list appropriately comes Solomon, lavishing his genius on Beethoven's C minor (Pathétique) and E major (opus 109) sonatas (ALP 1062). It is well known that he is to record all the Beethoven sonatas, and there should be a cordial welcome for his first such release on LP. Toscanini's recording of Respighi's "Pines" and "Fountains" of Rome on ALP 1101 is a cause for rejoicing since, as in the case of his more recent NBC efforts, the maestro has been accorded truly marvellous recording. Dame Myra Hess has replaced her splendid old issue of Schumann's piano concerto with a very desirable new one (BLP 1039) and our own Colin Horsley makes his first concerto appearance on discs with an otherwise unobtainable Mozart work, the E flat concerto, K449 (CLP 1012). This is coupled, somewhat inappropriately, with a collection of Chopin and Liszt bon bons, played with his usual efficiency. Ballet fans, who are among the most assiduous of record buyers, will be attracted by both the cover and the contents of CLP 1013, which offers a sensible and attractive coupling of "Les Sylphides" and "Carnaval" under the expert direction of Robert Irving.

The aforementioned "Tosca" is but one of Columbia's attractions for the month. Walter Gieseking has re-recorded the first book of Debussy preludes (33CX 1098). Sir Thomas Beecham continues his output of Handel, Mozart and Haydn, together with a remake of the haunting "Appalachia" by Delius (33CX 1112), and those to whom style is more important than perfect recording will pounce on Schumann's "Dichterliebe" as interpreted by the veterans Lotte Lehmann and Bruno Walter (33C 1020). The same people will undoubtedly be interested in a disc containing transfers of the late Dinu Lipatti's performances of Bach's B flat partita and Mozart's A minor sonata (33C 1021).

From Decca comes the long awaited disc (LX 3124) which completes Boyd Neel's performances of the twelve Handel concerti grossi. Kathleen Ferrier's deeply moving singing of the Brahms Alto Rhapsody has now been transferred to LP LXT 2850. The issue is the more touching since Clemens Krauss, who conducted this performance, has now also passed on. The reverse side contains Miss Ferrier's singing of a number of Brahms songs, some of which have not previously been available. No one should need to be reminded that Erich Kleiber's version of Beethoven's fifth symphony (LXT 2851) has been claimed the best yet. His new performance of the sixth symphony (LXT 2872) has stronger competition from several quarters, but I cannot imagine anyone wanting much better than this. Mendelssohn's entertaining Octet makes what is virtually its first appearance in its original form on LXT 2870. The players are that versatile group, the Vienna Octet.

ELECTRICAL AND TRADE SECTION

Radio and Electrical Appliance Marketing

BY W. L. YOUNG

LINKING SERVICE AND SALES

Our opening article made the point that selling is the result of team work and that everyone in business is a salesman. Every part of the organization plays its part and every means must be used to promote sales. There has, so far, been no mention whatsoever of the important part that the service side of an organization plays in the building of goodwill and sales promotion. While it is difficult to secure figures, general experience would indicate that perhaps the easiest way to lose goodwill is to sell and then subsequently fail to provide complete after-sales service.

A customer who buys an article, does so in the confident hope that it will give trouble-free service, and that nothing will go wrong with it. This thought is encouraged by sales personnel. All would agree that a salesman under pressure, would not, in any circumstances, indicate that the most complex electrical appliance or radio is likely to give trouble. If there is any suggestion of trouble, he would quickly point out that there is a guarantee to cover such a contingency and the firm has full service facilities. While it is very nice to be able to dispose of service problems in this manner, if the service facilities are inadequate or inefficient, the remarks of the salesman could prove very empty to the customer who does experience trouble. Even assuming that given fair usage, the modern electrical appliance is trouble-free and that the modern radio will not fail (these are rather extravagant claims), there are the problems which arise because of unintentional misuse or accidents. When a customer does have the misfortune to damage an appliance recently purchased, or unfortunately misuses it in a manner which causes it to fail, the speedy and efficient repair of such an article is very important.

Taking a parallel example right away from our own industry, those of us who have had the misfortune to have our new car scratched, or to experience some minor misfortune with mechanical trouble, will know that we like to have the paint-work repaired or the mechanical trouble attended to so that we can forget all about it, and enjoy our new car.

Well, the owner of an electrical appliance feels exactly the same way—it is all a part of human nature. We therefore arrive at the obvious conclusion that the service personnel in any business can assist in maintaining goodwill for the business and without a proper service "set up" goodwill will seriously suffer. The service department of a business, however, besides maintaining goodwill on sales which have been effected, can play its part in promoting sales because it has information which, properly used, provides the sales people with ammunition which will move the most hardened customer.

Any article has a certain useful life beyond which it becomes extremely expensive to maintain in operation. Endeavours to extend this useful life are most

costly. The service department of a business should know exactly the cost of maintaining an item which comes to it for repair. Take, for instance, a radio set. If proper records are kept, a service department should be able to tell any customer what they have spent over a period of time on a given set. Confronted by a considerable outlay for repairs, the buyer who contends that the set has many years of useful life ahead of it, may well realize that such thoughts must be reconsidered.

No owner, of what he calls "a good old faithful radio" which has served him well would respond to a salesman who stated that "this old crock of a set should have been pensioned off years ago and is a disgrace" but if approached and told that "while this set has given a good many years of faithful service it has cost 'so much' for repairs in the last 18 months and even now is still nevertheless an old set" his outlook might be different. When it is further pointed out that the components replaced (and they could be enumerated) are only part of the receiver and there are still many other components which, good though they have been, are coming to the end of their useful life, a serviceman can, in his own sincere way, frequently be more convincing than a salesman against whom there is usually "buyer resistance." If the service department is really on the job when a major repair comes in they could either ring or arrange for a salesman to ring the owner, stating what the repairs will cost. At the same time, previous expenditure should be indicated and the suggestion could be made that perhaps this might be an opportune time for the owner to consider a radio of a different type or a radiogram. Perhaps they would like to try such a set without obligation? With the co-operation we have just mentioned from the sales department, even if no sales eventuate, and even if the customer will not consider a demonstration, the action taken will do much to enhance the goodwill of the business. The client must concede that the firm concerned did not just rush in and repair the set regardless of cost. "they were good enough to ring me and tell me what it would cost. They were even interested enough to let me know what my previous expenditure was on this set; is it not obvious, dealing with a firm who is interested in me to this extent that when I consider a purchase I should turn to them?" Would it not be equally logical to suggest that the individual so approached would consider the firm worthy of other business.

We all know that the common cry to-day is, that no firm is interested in its customers—they just do not care. With the co-operation of a Service Department the sales section of any business could show that they did care and surely there will be a corresponding favourable customer reaction.

Service personnel should remember that they

frequently have right of access to people's homes to carry out repairs of appliances or to pick up and deliver repairs. This is something which, in most cases, is denied the average salesman. Service personnel can, therefore, act as scouts for sales in that they can report on existing equipment in a home and equip their sales personnel with other valuable information. As an example, a home which is obviously furnished to a very high standard and has the best of everything, but does not appear to have a refrigerator, is obviously a matter of interest. A serviceman, in delivering some article or attending to some appliance can quite easily ask the question—"Have you a sealed unit refrigerator?" and this will clear the matter up once and for all. If the reply is that they have no refrigerator at all, the obvious answer is—"My word! We are selling a lot these times because people now regard them as a necessity." Reporting back, this could quite easily be followed up by the appropriate tactful salesman.

There are cases when a serviceman is in a home and the lady of the house will say, "This vacuum cleaner just about drives me distracted"—he could offer the comment that if anyone could fix the vacuum cleaner his firm could, and if the lady is really driven to distraction it won't take much to get the cleaner away from her. A workshop inspection may show that the cleaner cannot be repaired or repairs can only be effected at a figure which cannot be justified by the general condition of the cleaner as a whole. Once again the link up with the sales department becomes important. The service side of a business has the confidence of its customers for doing a good job otherwise the customers would not have entrusted them with work. This confidence must not be underrated because from it can spring information which will give the sales staff prospects which might otherwise never come its way.

The outward appearance of a Service Department and its personnel, as seen by the general public, should always be considered by those in this department. Because of the nature of service work we all know it is very easy to have bits and pieces here and there and partially assembled appliances, etc., lying around all of which tend to create an air of untidiness, even though this, in many cases, is not warranted. A little thought can substantially reduce this apparent untidiness adding as well, in many instances, to the efficiency of the department. More important still, it gives an air of efficiency to the uninformed observer, into which class the bulk of the buying public fall. Maybe the reader will think this is "window dressing." Well, even if it is, a well dressed window builds up goodwill and if a little "window dressing" in the Service Department builds up goodwill for this department, the business as a whole gets the benefit of same including the sales section.

Some businesses have arranged their shop layouts in such a manner that the general public can see what is going on in the Service Department. When such a layout exists, it is more important than ever that an air of efficiency should prevail otherwise the sole purpose of such a layout is lost. The service personnel should also give an outward appearance of efficiency and the service van should look tidy. Apart from the utilitarian function which the Service Department carries out, it should, in short, also have as its goal a smart appearance.

There is another aspect of the activities of the Service Department which must be considered in building up goodwill and we refer to the care of appliances entrusted to it for repair. Naturally, we are assuming that the technical repairs will be carried out efficiently and to the highest standard. The goodwill which should accrue, in many cases, is severely offset by physical damage which takes place through carelessness in the handling of appliances. We all know of cases where radios have been returned with cabinet damage or the washing machine which has been returned with the extra chip. Nothing irritates a customer more than to find that the outward appearance of his possessions has suffered as a result of mishandling by a Service Department.

Looking at it from the opposite angle—if the Service Department in the process of repairing goods, sees that they are returned to the customer in at least the same outward condition as received goodwill is enhanced and customer confidence is maintained. There are times when, with very little effort, cabinet blemishes can be removed or cabinet chips can be touched up—never lose such an opportunity. Then when, as the day must surely come, purchase of a new appliance or radio is under consideration the firm concerned will be the first to come to the customer's mind. Obviously, goods can be damaged while on the service bench or in the Service Department, or, as is more frequently the case, in transit to or from a customer's home. However, wherever this damage occurs it is obviously going to be blamed on the Service Department so that the Service Department must, in its own interests, see that this damage does not occur.

There is no "rule of thumb" method by which we can assess the reason or reasons why a customer makes a purchase. All will know, however, that the reasons are usually numerous. Uppermost amongst the reasons why some specific firm gets patronage, is a customer's previous experience with it or the general comment which is heard regarding a firm or firms. Thinking it over, salesmen must concede that the groundwork of many of their sales has been laid by their Service Department. The Service Department should also appreciate what it can do and make every effort to see that it plays the full part in developing goodwill and making the path of the sales personnel easier to tread.

WANTED

Radio Serviceman

The services of a fully qualified and experienced radio and electrical serviceman are required to take charge of service workshop in fast growing South Island town.

Applicants should apply in writing, giving details of qualifications. All replies answered and treated in strict confidence. Permanent position and good salary to successful applicant.

Replies to "Serviceman," "R. & E. Review."

It pays to stock

EUTRON



ELEMENT

2 YEARS GUARANTEE



EUTRON

ELEMENTS



- More people ask for EUTRON by name than any other brand. Improved insulation and earthing make EUTRON the safest and most reliable element to recommend.

- Advertised over 11 radio stations throughout New Zealand and sold only through legitimate retailers.

Manufactured by ELECTRIC UTILITIES CO. LTD., 316 Great North Road, Grey Lynn, Auckland, W.2.

(Subsidiary of Nicholson's Holdings Ltd.)

CASH-IN ON EUTRON

POPULARITY

NEW PRODUCTS: LATEST RELEASES IN ELECTRICAL AND ELECTRONIC EQUIPMENT

This section of our paper is reserved for the introduction of new products and space preference is given to our regular advertisers. For further particulars contact Advertising Manager, R. & E., Box 8022, Wellington.

"TAYLOR" MODEL 171A ELECTRONIC TEST METER



Essentially an accurate valve voltmeter having the well-known characteristic advantages of a very wide frequency range and very high input impedance, the "Taylor" Model 171A Electronic Test Meter is also adapted to cover a wide range of resistance measurements, and can also be used as a direct reading output meter, scaled in decibels.

It is distributed throughout New Zealand by Messrs. A. R. Harris Co., Ltd., P.O. Box 1007, 74-76 Manchester Street, Christchurch, who welcome all inquiries. Retail price £38 19s. 2d.

The basic features of the instrument are a self-balancing double triode bridge network, and a miniature duodiode probe unit, compensated against drift.

As an A.C. voltmeter, the instrument will measure from 50 mV. to 250V. over a frequency range of 10 c/sec. to 200 m/sec., and is a peak voltmeter, scaled in RMS values. The input impedance on all ranges is 20 megohms, shunted by approximately 5 pF. With the probe plugged internally into the instrument and using the socket marked A.C., the frequency response holds good from 10 c/sec. up to over 20 mc/sec., or the probe may be used externally to cover the full range of up to 200 mc/sec.

As a D.C. voltmeter it will measure from 20 mV. to 1,000V., either positive or negative polarity, with an input resistance of 25 megohms on all ranges up to 250V. On the 1,000V. range the input resistance is 100 megohms. An external probe extends the 1,000V. range to 25KV. at an input resistance of 2,500 megohms.

For resistance measurement the ranges cover from 0.5 ohms to 1,000 megohms, and power output measurements may be read off directly in decibels over the range of -25 db. to +43 db. Zero reference level is 6 milliwatts into 500 ohms.

THE FAMOUS WHIRLPOOL NOW IN N.Z.

G. A. Wooller and Co. Ltd., North Island distributors of the famous Scott washing machines, now announce the introduction in their territory of the world-famous American Whirlpool Wringer Washer,

The Whirlpool is the very last word in washers in the medium price range. Modern design and first-class workmanship, plus the exclusive "Surgeflow" action make the Whirlpool a steady profit line for all dealers handling electrical appliances. Some of the other features that are making the Whirlpool so immensely popular are the high-speed drain pump, finger-touch wringer release (for extra safety), heavy duty protected motor and the heavy gauge steel construction completely rust proofed.

The Whirlpool Wringer Washer combines the know-how and experience of Whirlpool's leading American designers with the high quality engineering for which J. and A. P. Scott Ltd. of Dunedin are already famous.

Whirlpool washers are distributed throughout the North Island by G. A. Wooller and Co. Ltd., Box 2167, Auckland.

PACIFIC AND REGENT MODEL 6P2



This gay little portable that has proved itself so very popular will be back on the market again in time for the coming portable "season".

The Pacific and Regent 6P2 is a 6-valve broadcast model for use on its own batteries or on 230 volts A.C. power. The carrying case is finished in colourful tartan plastic, and the dial and all controls at the top make for easy tuning. Weight is only 10 lb.

The 6P2 retails at only £24 17s. 6d. Manufactured in New Zealand by the Akrad Radio Corporation Ltd., Waihi, and distributed by G. A. Wooller and Co. Ltd., Head Office Box 2167, Auckland. Branches at 50 Courtenay Place, Wellington, and 604 Colombo Street, Christchurch.

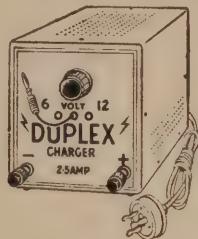
DUPLEX BATTERY CHARGERS

Messrs. TeeVee Radio Ltd., of 134 Albert Street, Auckland, have introduced a new range of carefully engineered battery chargers.

As the name implies, "DUPLEX" chargers are dual-voltage devices which charge either 6 or 12-volt batteries at the full rated current on either range. These chargers are of the ballasted type and maintain their rated output throughout the charging cycle. A unique feature is the bezel light which actually in-

dicates that the unit is in fact charging the battery at the correct amperage.

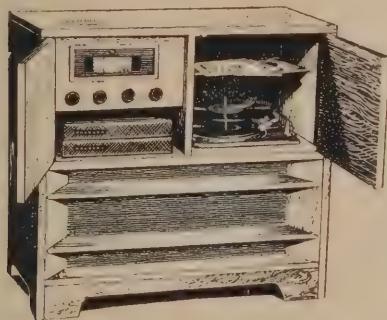
Heart of the charger, of course, is the well-known "ELECTRIX" selenium rectifier which is used as a full-wave bridge for highest efficiency. In short, this



is a generously designed charger, attractive in appearance, and carrying a manufacturer's guarantee of twelve months.

Models for $2\frac{1}{2}$ amps. and 4 amps. are in production at present, and will be followed by a complete range in the near future. The $2\frac{1}{2}$ -amp. model retails at £7 16s., and trade and wholesale inquiries will be welcomed.

PYE MODEL BRG



The BRG is the latest addition to the extensive range of Pye high-quality radios and radiograms.

The BRG is a handsome lowboy radiogram in the modern style. Doors at the front give easy access to the dial and controls on the left and the record changer compartment on the right. There is also a generous allowance of storage space for records in the upper part of the cabinet for extra convenience. The unobtrusive styling of the cabinet will fit into any furnishing scheme, and lend a quiet dignity of its own. The cabinet is available in a choice of either attractively grained Blonde Oak, Dark Oak, or highly polished walnut veneer.

The receiver incorporated in the new Pye BRG is a high quality 5-valve superhet for A.C. operation on the broadcast band capable of bringing in all stations usually required by the average listener. Power and quality of reproduction are unusually good for a 5-valve receiver.

The Garrard player unit incorporated in Pye's BRG automatically plays and changes 7 in., 10 in., and 12 in. discs, either long-playing microgroove or standard 78 r.p.m.

With these features and a retail price of only £69 10s. the BRG should bring high initial sales and a steady continuing demand.

Pye radios are manufactured in New Zealand by the Akrad Radio Corporation Ltd., Waihi and distributed by Pye (New Zealand) Ltd., P.O. Box 2839, Auckland.

The Black Box



Hi-Fi

The Black Box—Pye's new High Fidelity Record Player. A limited number of Pye Black Boxes was released a short time ago and the entire stock was immediately sold out. However, further supplies are expected shortly and these will be available to all Pye dealers.

Hi-Fi. (High Fidelity) is no novelty to radio technicians Hi-Fi records are almost commonplace these days but this is the first time that an instrument has been available to do justice to these recordings at a practical price.

Until recently Hi-Fi has existed only in men's dreams or—for technicians—in ponderous special equipment, incredibly expensive and complex, and needing almost an entire room to house.

Now all the massive equipment has been magicked away—reduced to a small box no larger than a small suitcase and priced to be within the reach of everyone who loves music. But although the result seems magic, the Pye "Black Box" was built only after many months of work by expert technicians who always had the dream of perfection before them.

The motor hidden away in the "Black Box" runs silently and evenly. There is no "rumble"—the distracting background noise which the rotating electric motor driving the turntable used to make. And there is no "wow"—the pitch doesn't vary—a thing which used to be very noticeable when long-playing records were being played—because Pye has fixed the speed of the rotation of the turntable.

The "Black Box" is fitted with a 3-speed record changer which will play mixed records, and employs a light-weight turnover-type crystal pick-up, with cantilever-mounted sapphire stylus (you'll call them

needles)—one for standard (78) and one for long-playing (33½ and 45) records.

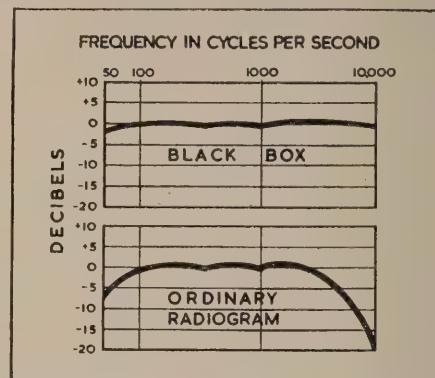
Both light-weight pick-up (which also responds to the wide frequency range needed for Hi-Fi reproduction of modern records) and precision-ground stylus with free vertical and horizontal movement are integral parts of the "Black Box" perfection. It would be impossible to follow the continuously varying, ultra-fine groove track accurately without them both—nor would precious records keep their mint condition so long.

There are other technicalities which explain why the "Black Box" is the only record-player which satisfies your ear. The "Black Box" employs a 4-valve push-pull amplifier incorporating negative feedback. This amplifier faithfully reproduces the full range of frequencies from the lowest bass to the highest treble, without the slightest distortion.

Via a high-quality output transformer—an essential component of Hi-Fi and conspicuously absent from low grade equipment—the amplifier feeds a pair of matched Hi-Fi loudspeakers accurately positioned on either side of the cabinet for non-directional, even distribution of sound throughout the room. These twin loudspeakers are specially designed components with high flux density and low bass resonance. The cabinet is robustly constructed in order to be free of audible resonances, and is so designed as to enable the loudspeakers to function in the best possible manner. With the lid closed the cabinet forms an acoustic chamber in which the loudspeakers can function properly, and give the extended frequency range necessary to recreate the original programme. Loudspeakers and cabinet work together as matched, integral parts of a system reproducing lifelike sound,

bringing to the ear of the listener the full range of pitch, "colour" and "presence" of the finest modern recordings.

FREQUENCY RESPONSE



The audio frequency response of the "Black Box" covers a range of 30 to 10,000 cycles per second. The accurately matched high fidelity pick-up, amplifier and loudspeaker are the key links in the system which produces this wide frequency range.

A glance at the diagram above will indicate the vast superiority of the "Black Box" to the ordinary radiogram in this respect.

The "Black Box" in a luxurious mahogany cabinet retails at £55. Sole N.Z. Distributors: Pye (New Zealand) Ltd., P.O. Box 2839, Auckland.

BOOK REVIEWS

FUNDAMENTALS OF TRANSISTORS, by Leonard Krugman, published by the John F. Rider Publishing Co., 480 Canal Street, New York, 13 N.Y.

Transistors have made one of the most exciting additions to the tools of the electronics engineer since the invention of the vacuum tube triode, and it bids fair to be the most important one, whether we like it or not. The appearance of a text on transistors is thus an event of the first importance to all those in the radio and electronic industries. The main difficulty confronting anyone who wants to learn something about these very new devices is that they are by no means simple in conception, since an understanding of their action depends upon a knowledge of atomic physics in relation to semi-conductors such as Germanium and Silicon. Add to this the fact that practically all the printed information about transistors exists in the form of abstruse original papers by those who have been responsible for the development of transistors, and we find that it is exceedingly difficult for the ordinary technician and engineer to find something from which he can learn about these important new devices without getting bogged down in fundamental physics, or in heavy mathematics.

The purpose of this book is to remedy this situation, by presenting "all the fundamentals necessary to assure a complete understanding of basic transistor operation, performance and characteristics." By and large, the author appears to have succeeded admirably in his objects. He does not shirk the issues. He introduces the reader to the basic structure of matter in a very few pages, but in such a way that even the most uninitiated readers must surely have no difficulty in visualizing the conduction of electricity by electrons in N-type germanium, and by "holes" in P-type germanium. From these simple beginnings, the properties of both point-contact and junction transistors are simply explained in terms of

equivalent circuits. At all points, the author is careful to point out similarities and differences between transistors and vacuum tubes, nor does he hesitate to explain the one in terms of the action of the other, where this is felt to be helpful.

The circuit action of transistors is explained in terms of the three types of operation, viz., grounded base, grounded emitter, and grounded collector, and this is extremely helpful when he comes to the later part of the book, where practical transistor circuits are treated. As the author points out, it is difficult at first to get the "feel" of transistor circuits, because with them, there is never the complete independence between input and output circuits that obtains with valve amplifiers. It is this fact, rather than that the transistor is inherently a current-operated device, while the valve is a voltage-operated one, which makes transistor circuits seem peculiar and difficult at first.

If the book has a fault, it is that some of the diagrams are not quite as clear as they might be. They are admirably drawn, and leave little to be desired on that score, but sometimes the ones which show the operating conditions in a transistor circuit are not quite well enough sign-posted. For instance, it is not always made clear whether the parameter on a family of curves is the base current or the emitter current. However, this is a relatively minor point of criticism of what is really an excellent book. Most, if not all of us will soon have to reckon with transistors, and wrestle with their peculiarities in a practical way. To use them successfully, it is even more essential than with valves that the technician should have a clear idea of how they work, not only as a physical device, but as a circuit element, and this can only be found out by a judicious combination of practical work and theoretical reading. This book should not fall far short of the ideal for the latter half of such a programme.

Summer Time Is Portable Time

Selling portable radio receivers is like selling any other type of radio. The more prospects the salesman contacts the more sales will be made. But he must learn to capitalize on the special appeal that portables hold. This article passes on some useful tips that have been collected for dissemination to readers in general. A few moments spent in reading them may pay off in extra profits for you.

Summer is not always the best time of the year to make radio sales, but a special opportunity does exist with certain types of receivers, notably portables. These handy and efficient little instruments can provide a welcome sales breeze during the summer doldrums if the trade will make the most of the opportunity. Several helpful ideas are contained in the following paragraphs, which in reality are a digest of plans a number of successful retailers in Australia, America, and Canada have made to capitalize on the market for portables.

Most retailers recognize the fact that most people just never think of taking a radio on holidays or pleasure trips, and the job is strictly a promotional one. To build sales volume, the retailer and his salesmen must first build public consciousness of the fun and entertainment a portable will provide.

In advertising, and in the store, portables could also be plugged as the ideal gift for other people, because summer brings with it University graduation, weddings, Christmas, and other gift occasions. It is also a good thing to remember that the person who buys a portable radio for gift purposes may also buy one for himself at a later date. He invariably will take it home and try it out, and will probably sell himself on the idea of owning one before he gives it away.

Then, too, customers who buy ordinary home sets are excellent prospects for portable radios. Salesmen should always remind customers that they can take their favourite programme all round the house, outdoors, down to the beach and away on holidays if they have portables. A portable is the most useful second set in the home because of its versatility, and this point should always be included in your salesmen's selling talk.

NEW BATTERIES

It should be remembered that many portable sets fall into disuse when the batteries wear out. It is surprising how many portables in the hands of the public are gathering dust for this reason, even although they have nothing else wrong with them. Substantially extra profits can be realized from the sale of new batteries if all callers are asked if they have a portable, and if the store can be of any assistance in rehabilitating it for the coming summer. If the answer is "No", a good opening has been created to suggest the purchase of one, which, in turn, offers a good reason to lead the visitor over to the display of portables in your store.

SPECIAL SERVICE OFFER

One of the most effective methods of attracting portable business is to promote a special free service offer in your store listing all of the features of such a check-up. The service should include a thorough valve, battery and wiring inspection, a complete operational test and cleaning the chassis. Retailers need not be reminded that the more attractive and comprehensive the list the greater their chances for attracting volume business.

Ways of presenting this message to prospects are many. A post-card mailing to all past portable purchasers is good for the small or medium size retailer,

especially if a double post-card is used so that all the customer need do is tear off the bottom, enter a check mark against service required, sign his or her name, and return mail tear-off to retailer. The Service Department can then pick up the receiver, or the customer can be asked to bring same into your store. Special window posters and newspaper or radio advertising are other media for publicizing a portable service campaign. New set sales from such a plan may also follow.

A well-known Victorian retailer keeps a register of all portable sales, which has proved to be of excellent value to him. Whenever a portable receiver is sold he lists the name of the purchaser, model number and brand of receiver, together with battery complement. He then notifies his customer that it will not be necessary to bring his portable into the store when new batteries are required, all he need do is give his name which will be looked up in the register and the appropriate battery equipment noted and provided. This register helps you to retain your customers when replacement batteries are required.

Window display is another method of securing prospects that should lead to sales. The size of the window is unimportant, and many retailers say that even a small window offers an excellent opportunity to convey one dominant appeal to those who pass. A large metropolitan retailer in Canada featured a camping scene in his window complete with a tent, mannequins or dummy models, trees, rocks, a "creek" containing running water, and an artificial camp fire. He plans to repeat the same display this year due to its past success. The importance of an *effective* window display cannot be over-emphasized, for facts and figures show that it takes the average passer-by three seconds to walk past the average store window. That means that retailers must have displays that will sell in three seconds, if they don't the chance is lost. Again, many radio and component manufacturers supply attractive point of sale display pieces, and offer the services of a window dresser to dress your window for you. A portable window gives you an opportunity to use originality, for the uses of the receiver are so varied. Make certain you use all this valuable assistance, and make this summer a bumper portable season.

Again, you can enlist the aid of other retailers in your town or suburb when preparing a portable window. Encourage your local sports store to include a portable in his sporting goods display; you will probably find your local travel agent would also be pleased to assist you in this connection. If these traders receive inquiries from interested prospects, they would send them to you to clinch the sale. When your local ladies' wear store is displaying a range of swimsuits they, too, would probably be pleased to add a portable for variety. If you can get such co-operation from these retailers you in turn could borrow from them sporting goods, travel goods and swimsuits for your window display, and send any interested purchasers of their merchandise to the suppliers concerned.

Some retailers also say that brightly illuminated store windows are definitely advantageous. They believe that they add greatly to the effectiveness of the display, and in most cases the power consumed is more than paid for by sales results.

ADVERTISING

When making up an advertisement for your local newspaper, several retailers have suggested that the public should be told the uses to which a portable radio can

be put. A few of the more popular uses are as follows: the second set in the home, camping and boating, the rented summer cottage (which seldom contains a radio), picnics, down on the beach, hunting trips, hiking and summer driving when the car is not equipped with a radio, etc. Then there is the salesman who may take a portable to his hotel, and the executive who wishes to keep in touch with the outside world.

Like window displays, portable-radio advertisements should contain originality and punch. It pays to spend a little time figuring out effective layouts. It is true that advertising alone cannot do the whole job. However, the firm that does advertise extensively usually pulls in far more sales than the one that neglects this important aspect.

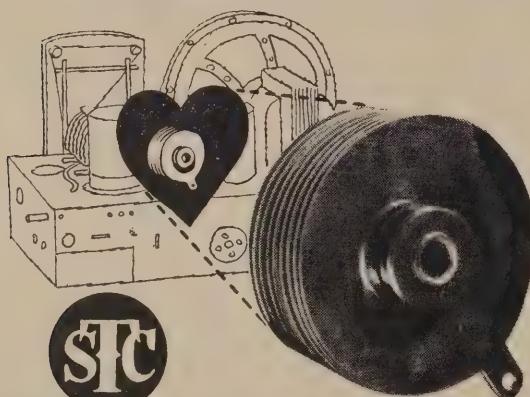
RENTALS BRING PROSPECTS

Renting out portables is a popular method of securing prospects and making the public conscious of the pleasure to be gained through ownership. Many retailers stress the point that if the prospect decides to purchase the set, the money paid in rent will be deducted from the selling price.

PERFORMANCE

Knowing the performance of all models in stock is important. As an example some portables are equipped

The HEART of the Portable



STC

MINIATURE RADIO RECTIFIER



- ★ Precision-built
- ★ Peak performance
- ★ Practically unbreakable

Servicing Portables? Replace with STC Miniature Radio Rectifiers. The world's standard first choice among progressive servicemen.

Write, phone, or call the Sole New Zealand Agents:

STANDARD TELEPHONES & CABLES PTY. LTD.

WELLINGTON Box 593
CHRISTCHURCH Box 983

AUCKLAND Box 571
WANGANUI Box 293

to receive stations most satisfactorily even in the most remote sections of the country, while others will only pull in stations which are fairly close by. Again some five-valve portables perform better than other five-valve portables, others operate from A.C. as well as battery power. All your salesmen should thoroughly familiarize themselves with these points concerning each brand of receiver in stock, so that they can readily present a forceful selling story to your prospect.

BATTERY LIFE

Battery life is another important subject. We cannot impress retailers enough with the need to be careful when discussing the length of time batteries should last in a particular portable. Here it is important to note the "A" and "B" battery drain for any particular make of portable, as this will naturally effect the life that can be expected from the "A" and "B" batteries. From two to three months is usually an average battery life, dependent of course upon the former factors and the extent to which the portable is used. It is better to under estimate than exaggerate the length of life that can be expected from batteries.

As an added service to your customer it is wise to tell him to remove the batteries from the set if any occasion arises when the receiver will not be used for a long period of time. This is just a precautionary measure, designed to prevent any possibility of damage to either the receiver or the batteries. Customers appreciate all these many saving tips, which prove that the retailer has their interests at heart.

In the main, you always endeavour to supply the brands of merchandise for which your customers ask, as this simplifies your selling task, and your battery range is no exception to this rule. It is recommended that you stock only the brand of batteries that offers the complete range, consistently good service, dependability and high quality.

Finally, remember this important point, a portable radio can be operated for approximately 2½d. per hour—surely the convenience and ability to take your entertainment wherever you go is well worth such a modest cost.

The Klystron

(Continued from page 36)

duced by electrons straying from the stream in the tube.

The magnetron, the close-spaced triode and the newly developed travelling-wave tube will be competitors of the klystron in certain fields, but the klystron will certainly more than hold its own in its large sphere of usefulness—as a transmitter where large amounts of power are required, as a source of local oscillator power in nearly all microwave receivers as a laboratory tool for studying microwaves and matter.

Recently there have been suggestions that the transistoristor, the new solid-state device for controlling the flow of electrons, may do away with vacuum tubes altogether. The fact is that neither the klystron nor the other microwave devices is likely to be supplanted by the transistor. For theoretical and practical reasons it seems improbable that the transistor can be made to operate at microwave frequencies.

The klystron has come into its own because it is a relatively simple device which can perform at high frequencies nearly every function required of a radio tube: it can amplify signals, multiply frequencies and generate small or large amounts of power.

TRADE WINDS

HIGHLY SUCCESSFUL NEECO COOKING DEMONSTRATION



It is some years since cooking demonstrations have been staged at the Wellington City Council Electricity Department Rooms, but the recent intense interest shown by Wellington housewives when "National Electric" presented a three-day demonstration proved that these programmes have lost none of their popularity.

The Demonstration Room was filled to overflowing each day, and the male demonstrator, Mr. D. H. G. Thwaits, a well-known caterer, staged luncheon, afternoon tea, and dinner for six persons on consecutive afternoons, using a Neeco Sovereign and a Neeco Consort electric range.

Each programme occupied about one and a half hours, and either soup or afternoon tea was provided for the large audiences. Mr. Thwaits, besides being an excellent chef, delivered his demonstration lectures with a touch of humour that was greatly appreciated by his audiences.

A representative of the Neeco organization was available to answer any questions about the ranges, and, coinciding with the cooking demonstration, a display of all types of Neeco electric ranges was held in the Electricity Department's showrooms on the ground floor.

* * *

TEEVEE RADIO LTD.

A firm with an enterprising name, TeeVee Radio Ltd., has just opened new premises at 134 Albert Street, Auckland.

Under the dynamic control of Managing-Director Mr. J. R. Eckford, TeeVee Radio Ltd. will specialize in the distribution of electronic components and devices to the trade.

With 24 years of experience in the radio parts industry with the well-known firm of S.O.S. Radio Ltd. behind him, Mr. Eckford can guarantee that this new company will be in a position to offer a service to dealers and manufacturers alike, backed by a personal appreciation of their problems.

In the course of a recent protracted overseas tour, Mr. Eckford made many valuable contacts, and secured a first-hand knowledge of current trends and practices. These, together with his proven sound business ability, should ensure success for the new venture.

A SHORT VISIT

Recently back from a five-day visit to Australia are George Wooller, Managing-Director of G. A. Wooller & Co. Ltd. and Pye (New Zealand) Ltd., Jack Walch, Sales Promotion Manager for these companies' products, and Arthur Kay, one of George Wooller's "back-room boys" who is responsible for good liaison between the manufacturing and distributing organizations.

While in Australia, Messrs. Wooller and Walch had discussions with the Sunbeam, Festival, and Crosley people over there. Jack Walch, we hear, picked up some valuable ideas on sales promotion methods and material, while Arthur Kay spent some time at the Crosley plant co-ordinating the supply of parts in connection with the New Zealand manufacture of Crosley Shelvador refrigerators.

* * * MR. FRED NOAD, JUN.

Fred Noad has joined the Auckland staff of G. A. Wooller & Co. Ltd. as record librarian of their new record division. In this capacity he will be responsible for all technical information on Festival, Westminster, and Vox discs, which were released on to the New Zealand market a few weeks ago.

Fred Noad is no newcomer to the record business and he's a keen collector himself. Fred tells us that he has been interested in recorded music for the past 14 years, six of which he spent with the New Zealand Broadcasting Service in the programme departments of 1ZB, 1YA, 1YC, and 1YD Auckland, and at 3YZ. His spare-time activities have included membership of the Auckland Junior Symphony, the Operatic Society, and Auckland Recorded Music Society (of which he was a foundation member).

Amongst hobbies, Fred Noad includes "record collecting plus a little photography." He has a collection of more than 1,000 discs, including many L/Ps, with plenty of the appropriate literature on the subject. Not the least of his possessions is specially built equipment for the playing of today's wide-range recordings.

* * * VISIT OF THE STORK

To Stan Shea, popular Managing-Director of Tele-Communications Ltd., Wellington, we extend our hearty congratulations on the birth of a son in September last.

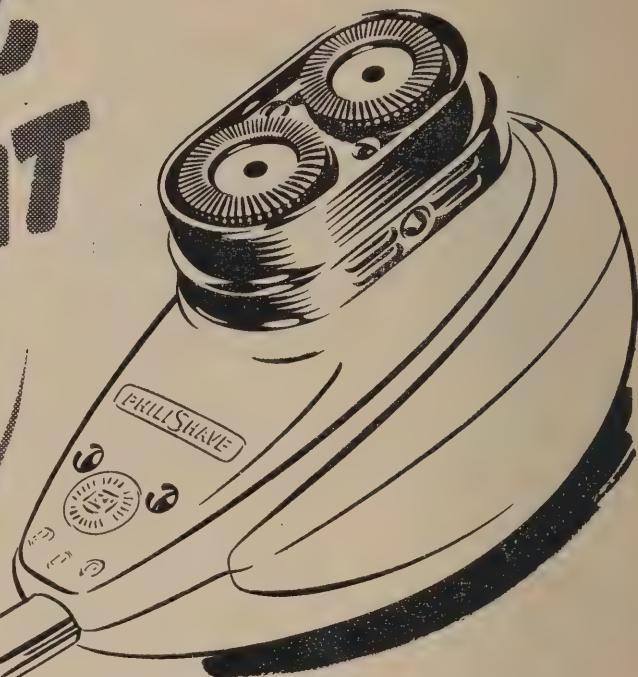
NEW PREMISES

Fresh paint and modern office equipment now grace the establishments of two well-known Wellington firms at 43 Lower Taranaki Street, Wellington.

(Continued on page 52)



**TERRIFIC
VALUE AT
£7.17.6**



NOW ANYONE CAN AFFORD
A PHILISHAVE '12'

Wonderful news! PHILIPS PHILISHAVE '12', biggest-selling electric dry shaver in the world, with Sales Tax off is reduced in price to £7.17.6! Now you can shave twice as fast ... twice as easy every morning with this 'double header' that just mows those whiskers down. PHILISHAVE '12' 'Double Header' is worth pounds more... a precision-built shaver of the highest possible quality. See your nearest PHILISHAVE '12' stockist. You'll be glad you bought a PHILISHAVE '12'! Handy battery model also available for £8.15.0.

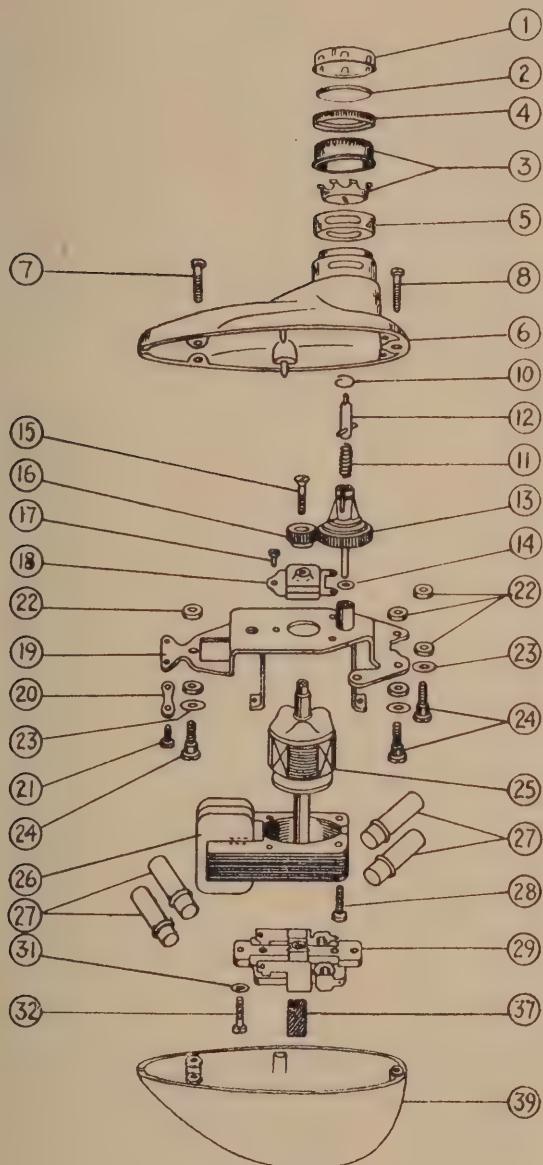
PHILIPS
"Double Header"
PHILI SHAVE "12"



MADE BY PHILIPS — FAMOUS ALSO FOR LAMPS, RECORDS, RADIO AND TELEVISION.

FOR THE TECHNICIAN

Service Instructions for the Philips "Philishave" Electric Dry Shaver Type 7735



fine (30 SWG) steel wire. Electrical faults can be located by normal continuity checks with a resistance meter. It is recommended that these instructions be read through before dismantling the shaver.

Motor

The motor is series fed, and is suitable for use on A.C. or D.C. mains supplies.

Supply voltage

The dryshaver can be used on 100-165v. or on 165-250v. supplies, A.C. or D.C. A series resistor must be used when using the higher voltage range. This resistor (R) together with a shorting switch is incorporated in the mains plug.

Noise suppression

The electrical interference or noise, caused by the sparking on the carbon brushes, is suppressed by the use of the capacitors C_A to C_E which are indicated on the circuit diagram.

Consumption

On 110v. supply, approx. 4 watts.

On 220v. supply, approx. 8 watts.

Speed of running

Motor—6000 to 8000 r.p.m.

Cutter—2500 to 3400 r.p.m.

General

The cutter head, which is mounted for ease of use on the side of the casing is driven at the correct speed by a gear train from the motor. The casing and plug are made of "Philite." The hair chamber contains two holes which are normally closed by the hair chamber ring. The holes are opened by rotating this ring, and the hair chamber can then be cleaned out, without removing the shaving head.

Circuit resistances

Terminal Resistance (On 100-165v.) = 940 ohms approx.

Terminal Resistance (On 165-250v.) = 2640 ohms approx.

Resistance R = 1700 ohms approx.

Resistance of $S_1 = S_2 = 190$ ohms approx.

Resistance of $S_3 = S_4 = S_5 = 280$ ohms approx.

Resistance between the brushes, 560 ohms approx.

The current required is approx. 40 mA.

General hints for repairs

(a) Care must be taken in handling the cutter head which should always be covered with the protecting cap unless actually needed for repair.

(b) The workbench must be free from dust and dirt as serious damage can be caused by particles of dirt getting between rotor and stator, or on the commutator.

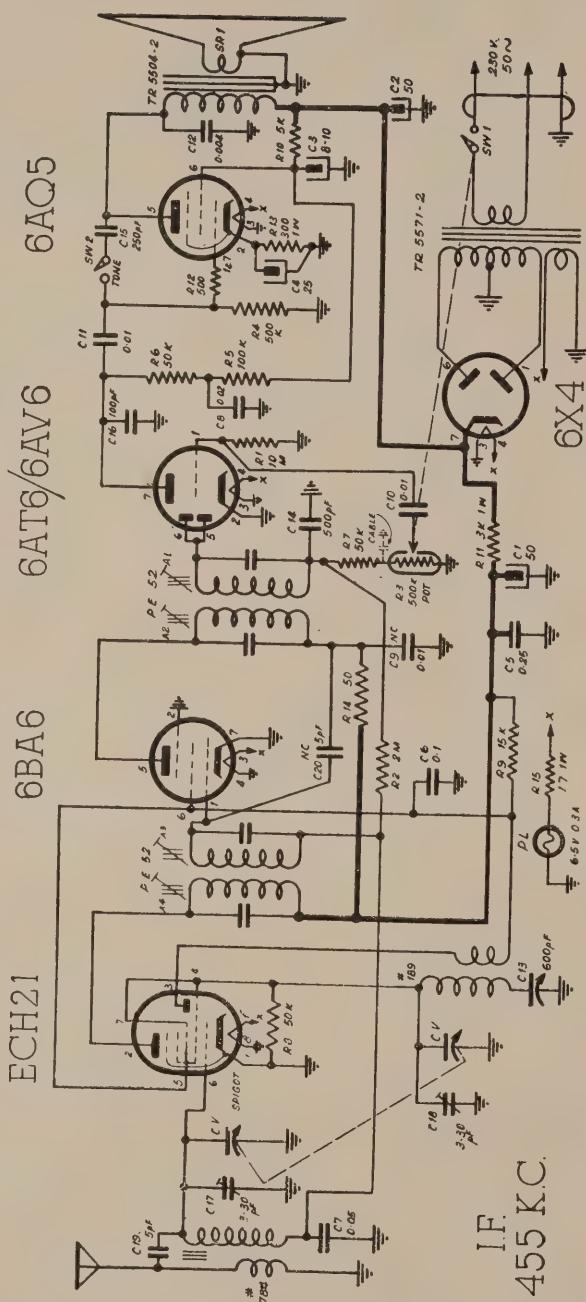
(c) Before returning a dryshaver to a customer check to see that the protective cap is in position on the cutter head.

(To be concluded)

Note

Providing the instructions stated herein are followed, little difficulty should be experienced in servicing the dryshavers. The instruments can be dismantled with the aid of a soldering iron, a small screwdriver, a pair of pliers, and a pair of tweezers. Sticking brushes may be removed with the aid of a piece of

CROMWELL BROADCAST RECEIVER MODEL 5153



SCHEMATIC DIAGRAM MODEL 5153

VOLTAGE READINGS								RESISTANCE READINGS									
Use	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
Conv.	ECH21	5.9 ac	120	40	-3.4	40	-0.5	-3.4	-	—	503K	518K	50K	518K	2.5M	50K	—
I.F.	6BA6	-0.5	—	5.9 ac	—	120	40	—	—	2.5 meg	—	—	—	500K	518K	2.5M	50K
Det.A.F.	6AV6	-0.4	—	—	—	5.9 ac	-0.4	—	—	10	—	—	—	550K	550K	500K	500K
Output	6AQ5	0	—	7.2	—	138	140	0	—	500K	300 Ω	—	—	500K	500K	500K	500K
Rect.	6X4	142	—	—	—	5.9 ac	—	142	150	250 Ω	—	—	—	250Ω	250Ω	250Ω	250Ω

1. D.C. voltage measurements are at 2,000 ohms per volt—A.C. voltage measurements at 1,000 ohms per volt.

2. Socket connections are shown as bottom views.

3. Measured values are from socket pin to chassis.

4. Nominal tolerance on component values make possible a variation of $\pm 10\%$ in voltage and resistance readings.

5. Volume control at maximum, no signal applied for voltage measurements.

6. Resistance readings in B+ circuits may vary widely according to condition of filter capacitors.

Trade Winds

(Continued from page 47)

IMPORTANT DEVELOPMENTS FOR DUCON (N.Z.) LTD.

It seems to have been the fashion recently for New Zealand manufacturers to announce their association with overseas manufacturers of electrical, radio and electronic equipment.

Elsewhere in this issue of *Radio and Electrical Review* readers will have noted the announcement concerning a substantial financial interest in Australia's largest electrical condenser manufacturing company, Ducon Condenser Ltd., Sydney, being acquired by the well-known American company, P. R. Mallory and Co. Inc. of Indianapolis, U.S.A., through its Australian subsidiary. This automatically includes an interest in Ducon's New Zealand subsidiary, Ducon (N.Z.) Ltd.

Incorporated in 1916, P. R. Mallory and Co. Inc. now has plants in Indianapolis, Frankfort, Terrytown, Chicago, Detroit, and Philadelphia in the U.S.A., as well as in England and Canada. 6,700 people are employed by the organisation, and annual sales exceed \$70,000,000. The company claims to be the world's largest manufacturer of electrolytic capacitors.

The full extent of the Mallory operations and products is too comprehensive to enumerate and describe here, but

we understand that in the near future, Ducon (N.Z.) Ltd. will be advertising Mallory products, including capacitors, resistors, potentiometers, television tuners and other electronic products, which will be of particular interest to New Zealand manufacturers of radio and electronic equipment.

The manufacture of these components in New Zealand represents definite progress towards the ultimate total production in this country of all the components for radio, television, and electronic equipment. Not only will this conserve overseas funds and assist the further development of New Zealand industries, but it is of the highest national importance for the production of equipment for defence purposes, and we take this opportunity to congratulate Ducon for such commendable expansion of its activities and interests.

PYE TELEVISION

Another demonstration of Pye Television was appreciated by visitors to the recent North Shore Industries Fair held at Takapuna, Auckland, under the auspices of the North Shore Chamber of Commerce.

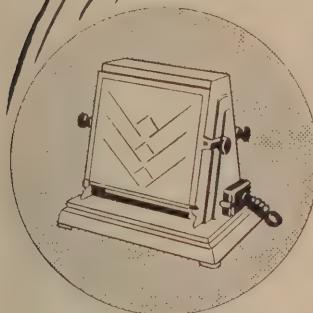
While on a much smaller scale than those given at the last Wellington Show and the Auckland Easter Show, this demonstration nevertheless drew large, interested crowds.

Unlike previous Pye demonstrations, that at Takapuna operated on a closed circuit, the equipment used being a Pye Image Orthicon Camera and Pye receivers.

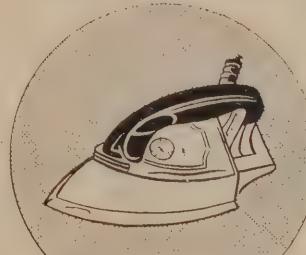
As modern as they're made



As efficient as can be



and great value for the money



NEECO
HOUSEHOLD
ELECTRICAL APPLIANCES

THE NATIONAL  ELECTRICAL

AND ENGINEERING COMPANY LIMITED

AUCKLAND • WELLINGTON • CHRISTCHURCH • DUNEDIN
HAMILTON • WANGANUI • HASTINGS • INVERCARGILL

We refer, of course, to Messrs. Green & Cooper Ltd. and W. G. Leatham & Co. Ltd., both of whom will be pleased to welcome clients in their spacious new premises.

THE NEECO BALL

Tickets for the 1954 Neeco Ball were sold out within two days of the booking plan being opened, and on Ball Night (Sept. 10th) the Majestic Cabaret had a capacity house of well over 400 for the dancing and general revelry.

The Ball has become something of a highlight in the Electrical Trade, and everyone again thoroughly enjoyed themselves.

An extension till 2 a.m. was enthusiastically applauded, and all in all this will have been one of the best gatherings of Neeco personnel and their friends for several years.

Missing and Stolen Radios

DARGAVILLE:

Philco, 6 valve, A.C. and battery portable, serial No. 11766, model 350.

AUCKLAND:

Pacific, 6 valve A.C./D.C. battery or wet battery portable, model 6P1, serial No. 30766, type No. 753. Either black or blue plastic metal case with edge control knobs; tone control on right of receiver dial; off-battery and main switch on top of receiver immediately beneath carrying handle.

H.M.V., 5 valve, A.C./D.C. broadcast model 495, serial No.

22239. Bakelite cabinet 10 in. x 6 in. x 7½ in., with H.M.V. engraved in front; dial 6 in. x 1½ in. on top of cabinet; one valve replaced by rectifier.

Autocrat car radio, brown, dial light defective, aerial tuning screw out of alignment with set. Speaker not removed with radio.

FRANKTON JUNCTION:

Philco, 5 valve table model, serial No. 40426. Brown plastic cabinet.

HAMILTON:

Gulbransen, 5 valve mantel model, serial No. 13188. Brown bakelite cabinet with perspex concave dial front and two white control knobs.

ROTORUA:

Pacemaker, 5 valve broadcast portable, model 5153AB, serial No. 30565. Grey plastic cabinet.

Ariel, 5 valve BC auto radio, serial No. 3626.

NEW PLYMOUTH:

Ultimate, 6 valve personal portable, serial No. 163931. Ivory bakelite case, small plastic handle on top, two white control knobs in front and small round dial in middle.

KAWERAU:

Columbus, 5 valve dual wave model 27 Exeter, serial No. 244448.

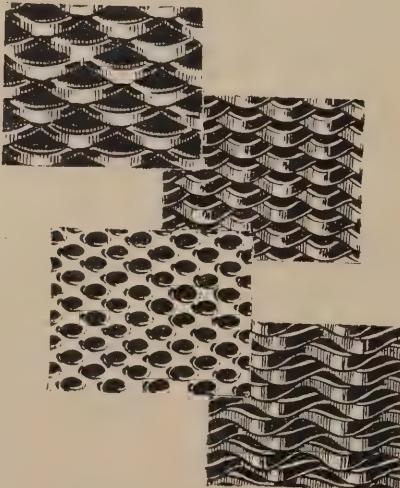
UPPER HUTT:

Motorola, 6 valve, 6 volt auto radio, in one piece. Hammered silver finish.

Autocrat, 6 valve, 12 volt auto radio with separate speaker. Bronze finish.

Two Philips, 5 valve battery/electric portable radios, serial Nos. 63158 and either 63376 or 63408. Maroon plastic cabinets.

EXPAMET EXPANDED ALUMINIUM



Characteristics of "EXPAMET" Expanded Aluminium: "EXPAMET" will not rust. It is light in weight. It is available EX STOCK in an attractive range of colours which will not peel, chip, or flake. It is easy to work.

HERE IS A NEW AND BEAUTIFUL MATERIAL WHICH CAN INCREASE THE SALES APPEAL OF YOUR PRODUCT.

CANTERBURY AGENTS:

Leonard L. Jones & Sons Ltd., P.O. Box 922, Christchurch. Telegrams, "Ardent."

THE ANSWER TO A THOUSAND PRODUCTION PROBLEMS

This particularly attractive material is available in a wide variety of meshes and gauges for specific applications. "Expamet" is ideal for such applications as . . . Electrical Screening, Radio and Television Loudspeaker Grilles, Fire-guards (electric, gas, or open fire), Air Filters, Machinery Guards, Waste-paper Baskets, Letter Baskets, Openwork Partitions, Framework for Coaches and Trucks, Meat Safes, Gate and Fencing Panels, Shop Window Displays, etc.

Full details of "Expamet" and its applications are available on request to: the Master N.Z. Distributors:

GAS TURBINES LTD.

G.P.O. BOX 2116, WELLINGTON
Telegrams: "GASTURB"



ELECTRICAL GOODS



It Catches the Eye of Passers-By

H. M. V. HEAT CONTROLLED IRON

Here's a sales prospect customers WILL LOOK OVER with more than casual interest and which retailers cannot OVERLOOK to stock! The H.M.V. No 5 Iron is a lightweight, cleverly designed iron that is thermostatically heat-controlled for complete safety, selecting at the turn of a dial just the right temperature for ironing rayon, silk, cotton, or linen. The bakelite handle is heat-resistant and heat-insulating . . . the soleplate is untarnishable . . . uniform ironing is assured . . . and ironing around and over buckles, buttons, pleats, etc., is made easy by the iron's shape. It's H.M.V., so it must be good—a good seller and a good product!

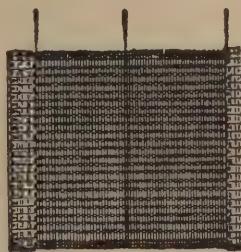
MAKE INQUIRIES NOW TO:

HIS MASTERS VOICE (N.Z.) LTD.

BOX 296, WELLINGTON



**CRESSALL
ASBESTOS - WIRE - WOVEN
RESISTANCE NETS**



Cost So Little
and
Help So Much

Stocks available from

Bradley's Electrical Co. Ltd.

57 Victoria Street, Wellington

62A Cook Street, Auckland

149A Manchester Street, Christchurch

New Zealand Distributors for

The Cressall Manufacturing Co., Ltd.,
Birmingham, England.

**XMAS HOLIDAY
TRAVEL**

**RAILWAY BOOKINGS
OPEN THIS MONTH**

It doesn't pay to leave important things until the very last minute.

That's why we remind you that bookings for Christmas holiday train travel open this month . . . so you'll be able to plan your vacation and reserve your train seats two whole months ahead.

Why not complete arrangements earlier this year? Avoid that last-minute rush and begin your summer holiday free from strain and worry.

— NEW ZEALAND RAILWAYS —

ADCOLA
PRODUCTS LIMITED

*The High Precision Soldering
Instrument ensuring*

SOUND JOINTS for SOUND EQUIPMENT

- ★ Ideal for the Production Line and the Home Constructor.
- ★ Always reliable—easy and safe to operate.
- ★ Light weight—no fatigue.
- ★ Robust construction and natural cool handle of moulded plastic.
- ★ Copper bit of high thermal conductivity and capacity.
- ★ Rapid initial heating and recovery of heat losses.
- ★ Suitable for A.C. or D.C. supply.
- ★ Low power rating, 23, 25, and 27 watts.



Manufactured in the following volt ranges: 6/7, 12/13, 22/24, 50/55, 100/110, 200/220, 230/250, or to customers' special requirements.

ADCOLA PVC and Polythene Electric Cable Strippers also available in all volt ranges.

Manufactured by

ADCOLA PRODUCTS LIMITED, England

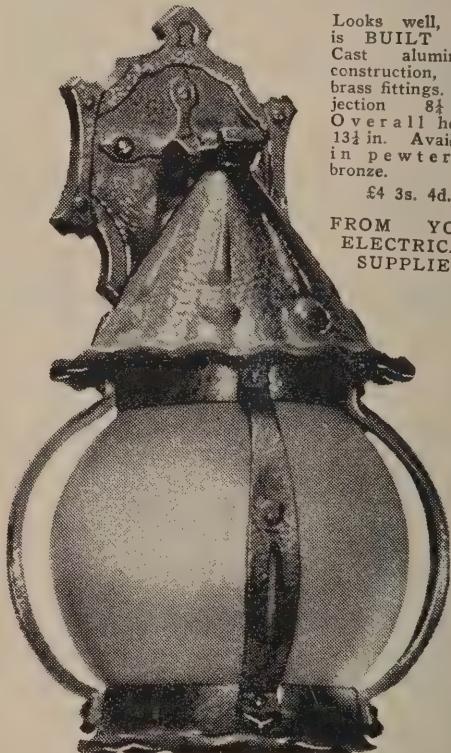
Sole New Zealand Representatives:

ELECTRONIC NAVIGATION LIMITED
NAGEL HOUSE, COURTHOUSE LANE,
P.O. Box 1905, AUCKLAND Telegrams: RADAR

Introducing

OUR NO 21

BRACKET LANTERN



Looks well, and
is BUILT well.
Cast aluminium
construction, with
brass fittings. Pro-
jection 8½ in.,
Overall height
13½ in. Available
in pewter or
bronze.

\$4 3s. 4d.

FROM YOUR
ELECTRICAL
SUPPLIER

Also available in ceiling fitment type, in which case
it is known as NO. 31, at the same retail price.

A ROBAT
PRODUCT

ROBERTSON & BATCHELOR LTD.

85 Clarence Road,
Riccarton, Christchurch

A 'DANDY'
Electric Shaver
FROM SWITZERLAND

For superior shaving
ease and comfort!



UNEQUALLED
VALUE
£7-17-6

For everyday ultra-smooth shaving—quick, clean, close—the DANDY Swiss Electric Shaver. Shaving head shaves perfectly in a jiffy! Clipper head trims superfluous hair and moustache. No more cuts, rash, or tender skin with DANDY.

12 MONTHS'
GUARANTEE

dandy

N.Z. Distributors:
Russell Import Co.
Ltd., P.O. Box 102,
Wellington.

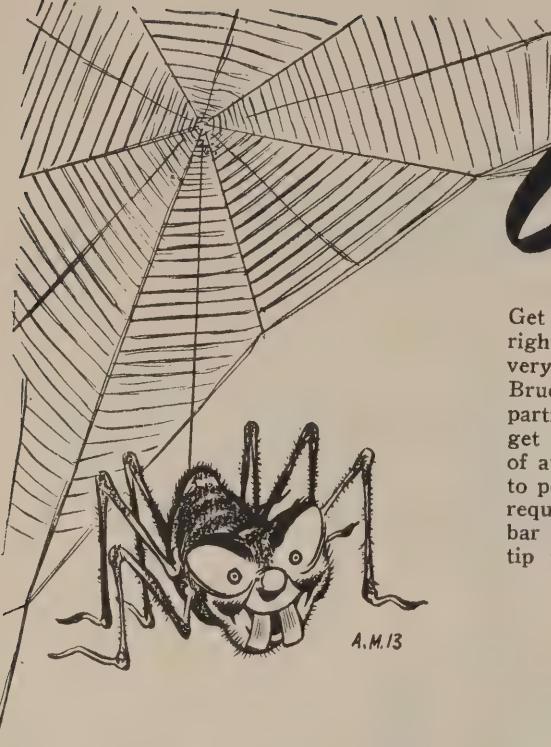
The
Superior Swiss Shaver

The DANDY shaving head cuts whiskers clean and close.



The DANDY clipper head trims moustache and hair of any length.





Get weaving!

Get weaving on any job and you usually find things spin along right merrily. At least that is our experience at "Auto." Like a very industrious spider we've heard about (cica Robert the Bruce) we refuse to let any project baffle us. Supposing we get a particularly knotty problem (and we DO get quite a few) we get right down to business and before you know it, our battery of automatics are turning out your component parts—precisioned to perfection and right on schedule. If YOU have any production requirements concerning component parts machineable from bar stock—any diameter up to 2½ inch round section—take a tip from Bruce's spider. Get weaving, and "drop us a line."

**AUTO MACHINE
MANUFACTURING CO. LTD.**

18-20 Nelson Street, Auckland, C.1.
P.O. Box 179. Telephone 31-638 (3 lines).
Telegrams: "Auto."

Bentima ELECTRIC CLOCKS



**FULL Four-Quarter
WESTMINSTER CHIMES**

The Bentima Co Ltd., of England, offer you an entirely NEW range of fully guaranteed Synchronous ELECTRIC Westminster Chime Clocks, in oak and walnut cases.

The initial shipment comprising a selection from the styles illustrated above will arrive in New Zealand this

month, in time for delivery to retailers for the Christmas trade.

Every BENTIMA Electric Clock is fully guaranteed! Retail price will range from approximately £10 to £20. Write for full details NOW to the New Zealand agents.

New Zealand Agents: C. & A. ODLIN TIMBER & HARDWARE CO. LTD., Box 1995, Wellington.

Direct talk . . .

Ericsson

push - button



telephones

Give the man at the top finger-tip control of his entire organization.

The Ericsson system is backed by over fifty years of experience in the telephone field. These instruments combine beauty of line with complete efficiency. Five, ten, or fifteen table or wall sets are available in black or ivory mounted plastic.

SELLING AGENTS REQUIRED

**THROUGHOUT THE DOMINION
FULL DETAILS ON APPLICATION
TO SOLE NEW ZEALAND AGENTS:**

GREEN & COOPER LTD.

Phone 54-418, 43 Lower Taranaki Street,
Wellington. Telegrams: Fidelatone.





New Zealand Agents:

E.M.I. SUPPLIERS

(Trade Division of H.M.V. (N.Z.) Ltd.)

162-172 WAKEFIELD STREET, WELLINGTON C.P.O. Box 296 Phone 54-890

EDINBURGH

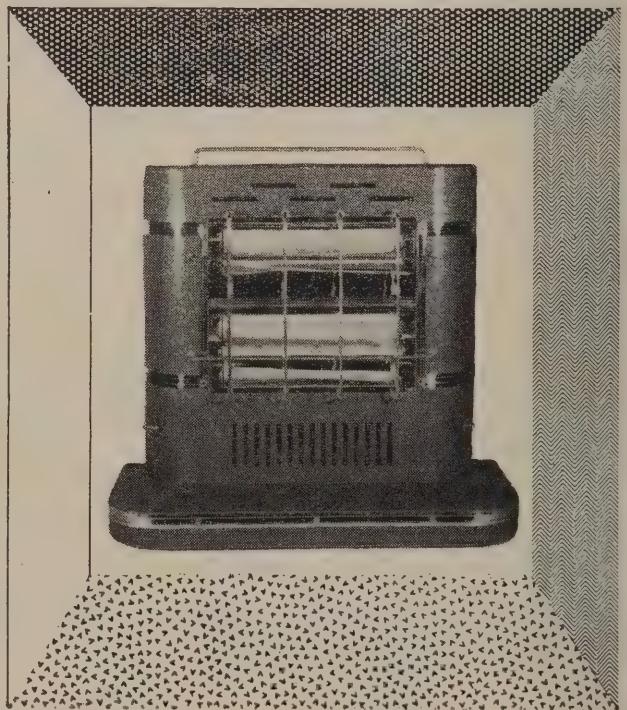
Electric Radiator

ANOTHER PANAMA PRODUCT

- ★ Two 10-inch bars
- ★ Individual Switching
- ★ Red Glow Visible at Base
- ★ Louvres for Heat Dissipation
- ★ Crackle Finish
- ★ Chromium Trimmings
- ★ Easily Portable

Available from

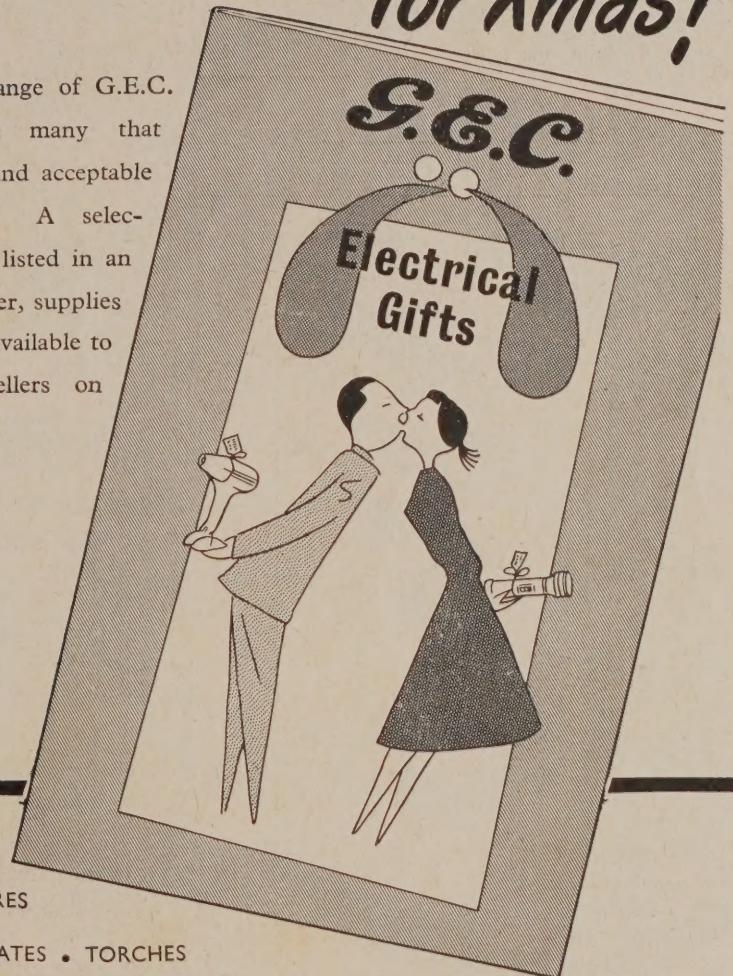
CORY-WRIGHT and SALMON LTD.



AUCKLAND ... WELLINGTON
CHRISTCHURCH DUNEDIN

G.E.C. Electrical Gifts for Xmas!

Within the range of G.E.C. products are many that make useful and acceptable Xmas gifts. A selection has been listed in an attractive folder, supplies of which are available to electrical resellers on request.



CLOCKS • FIRES

WARMING PLATES • TORCHES

TORCH BATTERIES • HAIR DRYER • KETTLES

RADIO BATTERIES • DECORATION LIGHTS • TOASTERS • HANDLAMPS

HOME BROADCASTER • IRONS • FITTINGS • CLEANER • FLOOR POLISHER

Sole New Zealand Representative

BRITISH GENERAL ELECTRIC CO. LTD.

WELLINGTON • AUCKLAND • CHRISTCHURCH • DUNEDIN



Champion

ELECTRIC COOKER

See it at the Showroom of your nearest Electrical Appliances Dealer.

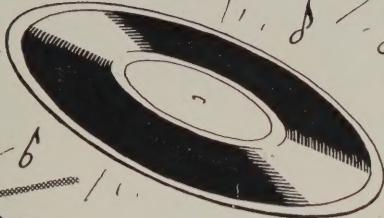
Made by RADIATION (N.Z.) LTD., Brinsley Works, Dunedin.

CEJ/64.4T

To Help
YOUR
SALES

Heavy space bookings for the above advertisement have been made in all the most important National Magazines and Metropolitan and Provincial Dailies.

LIBERAL FRANCHISE TO STOCKISTS



3 RECORD ANNOUNCEMENTS!

FIRST RELEASE in N.Z. of



Festival RECORDINGS

Pressed from the original U.S.A. recordings of these world-famous studios:
DECCA RECORDS INC.; CORAL RECORDS INC.; BRUNSWICK
RADIO CORPORATION; RECORD CORPORATION OF AMERICA;
SAVOY RECORD COMPANY INC.; REGENT RECORD INC.; METRO-
NOME, SWEDEN; FESTIVAL, in populars, evergreens and classics.

ANOTHER N.Z. FIRST!

EXTENDED PLAY 78 r.p.m. RECORDINGS

Festival's unique process brings long-play advantages to single-speed record players—two full-length numbers on EACH side of Extended Play 78 r.p.m. discs! Also available are Standard 78 r.p.m. and Long Play 33 1/3 r.p.m.—all featuring such top-flight artists as Georgie Auld, David Rose, Rafael Mendez, Ethel Smith, George Shearing, Burl Ives, Todd Duncan, Soloists and Members of the Vienna State Opera.

NATURAL BALANCE



WORLD FAMOUS



Long-playing high-fidelity WESTMINSTER and VOX classics at last available in New Zealand! Triple-award winners for the last three years of Grand Prix du Disque, Paris. WESTMINSTER recordings have been acclaimed by the world's critics for their technical excellence.

LOOK AT THESE TITLES: Hundreds of new-release titles at record shops now include: Percy Faith Concert, Ethel Smith's Toy Parade, Al Sack Encores, Stars of Song, Frankie Laine Presents, Music of Richard Rodgers, Victor Herbert Favourites, Negro Spirituals, Symphony No. 7 (Beethoven), Tosca (Puccini), String Quintet No. 1 (Brahms), Mendelssohn Violin Concerto No. 1, Famous Strauss Waltzes.

AT RECORD SHOPS EVERYWHERE

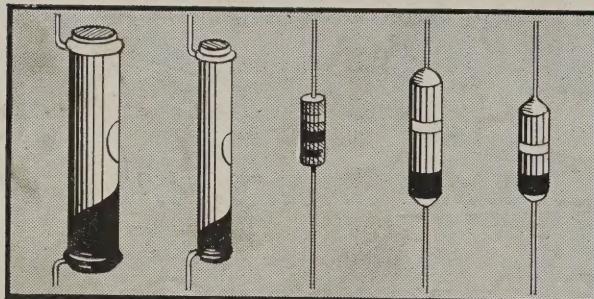
Sole New Zealand Distributors:

G. A. WOOLLER & CO. LTD.

P.O. Box 2167, Auckland, and at Wellington and Christchurch.

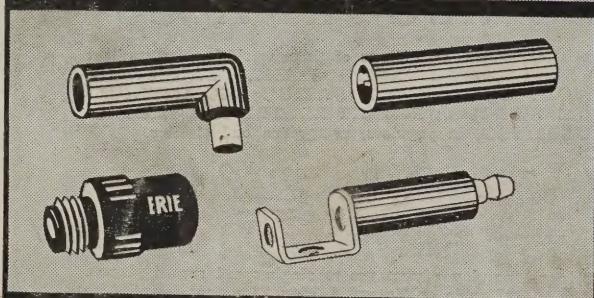


Electronic Component Products



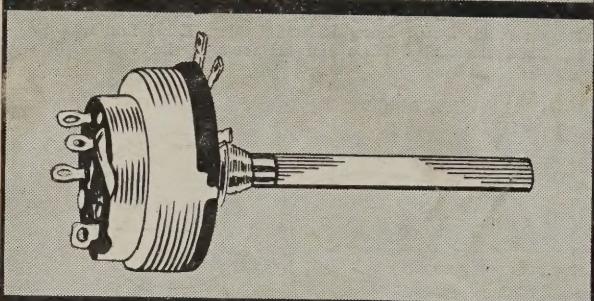
CARBON RESISTORS

Erie Resistors are the finest offering on the New Zealand market. Constant research has not only improved their electrical characteristics, but has resulted in the development of new, smaller units and insulated types that meet the urgent demand for efficient performance in restricted space under severe operating conditions.



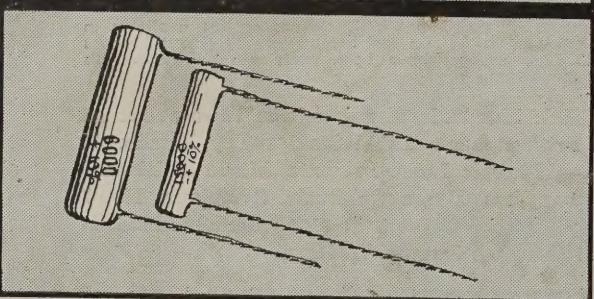
SUPPRESSORS

Erie Suppressor Resistors are designed for the suppression of high-tension interference caused by the ignition system of internal-combustion engines without detracting from the performance of the engine. Available in four different types sufficiently diverse to fit any known make of car.



POTENTIOMETERS

Erie Potentiometers are of the carbon-track type and embody a carbon-sprayed bakelite element with a maximum overall dissipation of one watt; and are available in values from 2,000 ohms to 2 megohms inclusive, either with or without switches, which are of the S.P. Single Throw and D.P. Single Throw types only.



SILICONE FINISH WIRE-WOUND RESISTORS

Erie Silicone-finish Wire-wound Resistors are wound on a high-grade ceramic former which will withstand considerable thermal shock without disintegration. Windings are spot-welded to flexible copper nickel or nickel chrome wires brought out in the form of pigtails tinned with hot solder or connected to nickel silver bands according to individual preference. A wide range of ratings is available from stock in the more commonly used resistance valves. Quotations can be given for non-stock sizes.

New Zealand Distributors:

Auckland Wellington Christchurch Dunedin Hamilton Palmerston North Invercargill

TURNBULL and JONES LTD.